THE

ANNUAL REPORT

OF THE

SUPERINTENDENT OF GOVERNMENT FARMS

(MADRAS PRESIDENCY),

FOR THE YEAR ENDING 31ST OF MARCH 1874.

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CONTENTS.

	Paras.
GENERAL—	
Weather ...	1 to 4
Tours ...	5
Office-work ...	6 to 9
Agricultural Apprentices on the Sydapet Farms ...	10 to 16
Improvements on the Sydapet Estate ...	17
The Wudder Settlement on the Sydapet Estate ...	18 to 24
Snakes and other vermin killed on the Sydapet Estate ...	25 to 28
Madras Agricultural Exhibition ...	29
The absence of a local demand for agricultural produce of a superior kind ...	30 to 35
Fish preservation ...	36 to 38
The field laborer ...	39 to 43
Live fences ...	44 to 45
Deep and shallow cultivation ...	46 to 50
Loss by thick sowing and by using bad seed ...	51 to 55
SYDAPET EXPERIMENTAL FARM—	
Cattle ...	56 to 65
Sheep ...	66 to 70
Pigs ...	71 to 73
Cotton ...	74 to 86
Maize and cotton ...	87 to 93
Burmese paddy ...	94
Shamay...	95 to 98
Paddy fodder ...	99 to 101
Indigenous grasses ...	102 to 106
Field vegetable crops ...	107
Fruit and fuel plantations ...	108 to 109
Results of inquiries in other countries for crops suited for field cultivation in the Madras Presidency ...	110 to 112
Ground-nut cake ...	113 to 117
Subsoil draining ...	118 to 126
Double mhote ...	127
Bullock gears ...	128
Straw-burning engine ...	129
SYDAPET MODEL FARM ...	130 to 141
IMPLEMENT WORKSHOPS ...	142 to 147
ESTABLISHMENT ...	148

APPENDIX.

1. Rainfall of the year.
2. Government Farm's Expenditure.
3. Valuation of Live and Dead Stock belonging to the Experimental Farm.
4. Implements, Carts, Machines, &c., belonging to the Experimental Farm.
5. Do. do. do. to the Model Farm.
6. Do. do. do. to the Implement Workshops.
7. Catalogue of Books added to the Library.

THE ANNUAL REPORT OF THE SUPERINTENDENT OF GOVERNMENT FARMS, FOR THE YEAR ENDING 31ST OF MARCH 1874.

GENERAL.

1. *Weather.*—The total rainfall of the past year was 48·07 inches, or only about half the amount that fell in the previous year. Rain fell on sixty-nine days; the total amount collected approximated very closely to the average of the previous ten years, but its fall was unseasonable.

2. In April rain fell on three days, during which 2·38 inches were registered, giving an average of 0·79 inches for each wet day; there was no rain whatever in May, so that the little good that was done by the fall in the previous month was negatived. In June the quantity registered was 1·68 inches; but, as it fell on six days, the average for each wet day was only 0·28 of an inch, a fall too light to be of any benefit during the scorching heat that characterises that month. The fall in July was even lighter; though rain fell on nine days, the total quantity registered was only 1·50 inches, giving an average of 0·17 of an inch for each wet day. In August the fall was somewhat more favorable, though still below the average; in this month rain fell on seven days, and the total fall was 3·16 inches, or 0·45 of an inch for each wet day. Thus in the three months—June, July, and August—though rain fell on twenty-two days, the total fall only amounted to 6·34 inches. The average of the previous ten years for these three months was 12·56 inches precipitated on thirty-one days, so that during this quarter, which is the period of the year in which cumboo, gingelly, and other hot weather crops are grown, the rainfall was just about half the quantity that we usually get, and this is generally but just sufficient to meet the wants of the crops then cultivated. The result of this unfavorable season on the Sydapet Farms was that the hot-weather crops had to be resown several times, and the sowings, which were at length successful, being from a month to six weeks behind time, the harvest was proportionally delayed, and the consequence of this was that the land on which these crops grew, could not be cleaned and prepared in time for the regular cold-weather crops, which in their turn were delayed. In September, which is the harvest month for hot-weather crops, the rainfall was unusually heavy; though there were only seven days in this month on which there was rain, the total quantity collected was 7·24 inches, or a little more than one inch per wet day. In October rain fell on eighteen days, and the total fall was 12·30 inches; throughout this month rain fell in gentle showers, the average for each wet day was 0·68 of an inch. In November the fall was unusually light, being only about half the average fall; in this month rain fell on fourteen days, and the quantity registered was 8·91 inches; the whole of this fell in the latter half of the month, there was no rain whatever until the 12th. The rainfall in December was excessively heavy, being nearly twice as great as the average fall; though there were only five wet days, the fall was 10·90 inches, or 2·18 inches for each wet day. I would particularly invite attention to the rainfall registrations of this month; it will be at once observed how delusive monthly totals are. I have said that the rainfall of this month was nearly twice as great as the average, yet our crops actually suffered severely from drought in December, for after the 4th of the month there was only one day on which rain fell, and this only amounted to half an inch; this drought was especially severe in its effects, coming as it did so closely after heavy rain, which had caused an excessive rank growth in the crops and rendered them particularly liable to injury, when the drought suddenly checked this rapid growth. During January, February, and

March, there was no rain whatever, and many of the crops sown in November were rendered useless, excepting for providing fodder.

3. The following table shows the amount of rain that was registered during each month, and the number of days in each month on which rain fell, compared with the average monthly registrations of a similar kind for the preceding ten years :—

—	1873-74.		Average of the previous 10 years.	
	Inches.	Wet Days.	Inches.	Wet Days.
April	2·38	3	0·55	1·1
May	...	...	0·85	1·4
June	1·68	6	2·73	7·8
July	1·50	9	4·52	11·2
August	3·16	7	5·31	12·4
September	7·24	7	3·83	9·4
October...	12·30	18	8·67	10·9
November	8·91	14	13·66	14·0
December	10·90	5	5·64	6·3
January	...	...	1·08	1·4
February	...	...	0·91	0·9
March	...	...	0·08	0·4
Total ...	48·07	69	47·83	77·2

4. The following is a statement for the same period, made out in weekly totals, which I think exhibits the rainfall of the year in a much more satisfactory way than the method usually adopted :—

—	1873-74.		Average of the previous 10 years.		—	1873-74.		Average of the previous 10 years.	
	Inches.	WetDays.	Inches.	WetDays.		Inches.	WetDays.	Inches.	WetDays.
1st Week...	2·20	2	...	...	28th Week...	4·22	6	·38	1·1
2nd do. ...	·18	1	·01	·1	29th do. ...	1·55	4	4·81	4·0
3rd do. ...	...	...	·19	·3	30th do. ...	1·41	2	1·75	3·1
4th do. ...	...	...	·35	·7	31st do. ...	1·08	1	1·74	2·4
5th do. ...	...	...	·76	·4	32nd do. ...	...	...	2·27	3·1
6th do. ...	...	...	·01	·3	33rd do. ...	2·24	5	2·15	2·9
7th do. ...	...	...	·05	·3	34th do. ...	2·80	3	4·00	4·0
8th do. ...	...	...	·03	·3	35th do. ...	10·02	7	4·60	3·4
9th do. ...	...	...	·13	·3	36th do. ...	4·25	3	4·16	2·6
10th do. ...	·48	2	·64	1·0	37th do. ...	...	...	·62	1·3
11th do. ...	·66	2	1·19	2·5	38th do. ...	·50	1	·30	·6
12th do. ...	·17	1	·32	1·8	39th do. ...	...	...	·19	1·2
13th do. ...	·37	1	·45	2·3	40th do. ...	...	...	·03	·4
14th do. ..	·56	3	·25	1·6	41st do. ...	...	...	·01	·1
15th do. ...	·04	1	1·54	2·9	42nd do. ...	...	...	·57	·6
16th do. ...	·15	2	·99	3·0	43rd do. ...	...	...	·47	·2
17th do. ...	·75	3	1·07	2·6	44th do. ...	...	...	...	...
18th do. ...	·53	2	1·25	2·6	45th do. ...	...	...	·70	·6
19th do. ...	...	...	1·70	3·4	46th do. ...	...	...	·02	·1
20th do. ...	...	...	·54	3·0	47th do. ...	...	...	·12	1
21st do. ...	2·46	4	1·17	2·0	48th do. ...	...	...	·07	·1
22nd do. ...	1·12	2	1·27	2·7	49th do. ...	...	...	·08	·4
23rd do. ...	·23	1	·77	2·7	50th do. ...	...	...	...	...
24th do. ...	...	...	·92	2·3	51st do. ...	...	...	...	...
25th do. ...	2·50	3	1·40	2·4	52nd do. ...	...	...	...	...
26th do. ...	3·56	2	·64	1·5					
27th do. ...	4·04	5	1·15	1·9	Total ...	48·07	69	47·83	77·2

5. *Tours.*—No tours were undertaken by me during the past year, as I had found by experience that I could not, in a satisfactory way, when on tour, perform the many important duties which I am now called upon to undertake, unless aided by a really competent Assistant at my head-quarters; while my duties, as Secretary to the Exhibition, required my presence in Madras during the cold season.

6. *Office-work.*—My office-work still continues to increase; it was exceedingly heavy during the past year; to some extent this was caused by the Agricultural Exhibition in February last, to which I was Secretary; in connection with this I had to conduct a very large amount of correspondence, and as all the money-transactions relating to this undertaking were conducted in my office, a great amount of additional labor was thrown upon my establishment, and this, in connection with the fact that the office-work was already much behind, has placed me rather in a difficulty with regard to the performance of current work; but with the aid of the Assistants recently appointed, I hope, before the expiration of another year, to have worked off all arrears.

7. The large increase in my office-work is not, I think, any cause for regret, provided I am furnished with the means to enable me to keep pace with it; but it is a serious labor and a cause of much anxiety to me, the effort to carry on my current work with such an accumulation of arrears demanding more or less urgently my attention.

8. It is, I consider, greatly to be desired that, as far as possible, my office should be the medium through which agricultural information relating to the Presidency should be collected and disseminated; to some extent this is already recognised as its legitimate work, and I have done all I could to increase its usefulness in this direction by encouraging correspondence with persons, in all parts of the Presidency, interested in agriculture, who may be able and willing to afford information, or who may be anxious to benefit by our experience.

9. The following questions selected from those put in the demi-official letters received by me during the last year will convey a general idea regarding the subjects on which I am consulted. The questions included in this list are but a small number of those that have been answered during the year:—

District, Presidency, or Province from which the Questions came.	General Nature of Question.
Cochin	Requesting full instructions regarding the cultivation of guinea grass.
Madras	Asking for directions regarding the method of working European ploughs and cultivators.
Cochin	Asking for information about the culture of fodder crops.
Madras	Asking for information about the ground-nut oil cake, how used, quantity given daily to working cattle, &c.
Bellary	Asking advice regarding shrubs best suited for forming live fences in the Bellary District.
Ganjam	Asking for information regarding the culture of Carolina paddy and New Orleans cotton.
North Arcot...	Asking for advice regarding laying down land under pasture and the variety of grass best suited.
Wynaad	Asking for advice regarding fodder crops best suited for Wynaad and their general cultivation.
Rangoon	Asking for information about the cultivation of potatoes and the manure to be employed; also desiring to be informed the breed of sheep best suited for the higher lands in Burmah.
Madras	Asking for opinion regarding the probable success of a European butchery in Madras.
Madras	Asking for advice regarding the use of ground-nut cake in feeding horses.
Mysore	Asking for information and advice regarding turn wrest ploughs.
Punjab	Asking for advice regarding the use of ground-nut cake in feeding horses.

District, Presidency, or Province from which the Question came.	General Nature of Question.
Trichinopoly	Asking advice regarding the probable growth of grass and cocoanut trees under sewage irrigation.
Wynaad	Asking information regarding the most suitable manure for land under coffee.
Mysore	Asking for advice regarding the construction of cattle-sheds.
Madras	Asking for advice regarding the construction of a sheep-pen for fattening sheep.
Ganjam	Asking for detailed information regarding ploughs best suited for use in native agriculture.
North Arcot	Asking for advice regarding the construction of cattle-sheds.
Mysore	Asking how adulteration can be detected in a sample of ground-nut cake.
Bombay	Asking to be informed the steps to be taken to gain a knowledge of the practices of improved agriculture.
Madras	Asking information regarding the feeding qualities of ground-nut oil cake.
North-West Provinces ...	Asking for advice regarding the preparation of paddy hay and its value for horses.
Madras	Asking for opinion regarding the supposed tendency of ground-nut oil cake to excite unduly the urinary organs of animals fed on it.
Madras	Asking for instructions regarding the cultivation of Carolina paddy.
Tanjore	Opinion asked regarding purity of a sample of ground-nut oil cake and whether fit for use in feeding horses.
Travancore	Asking where a pupil could be trained in a knowledge of agricultural chemistry, and asking for suggestion that would assist a beginner in analytical work.
Godavery District	Asking for information as to the probable effects of nightsoil used as a manure for trees, and asking opinion regarding general value of nightsoil as an agricultural manure.
Malabar	Inquiring the commercial value of groundnut oil, and asking the uses to which it can be applied.
Ganjam	Asking to be informed how to select a sample of soil for analysis? how to drain the subsoil of land? and how to improve indigenous breeds of cattle?
Calcutta	Asking for full details of cultivation of the ground-nut, and description of climate and soil best adapted for its healthy growth.
Kistna District	Asking for advice regarding the study of agriculture, and the sciences bearing thereon.
Wynaad	Asking advice regarding the treatment of cattle suffering from rinderpest.
Trichinopoly	Requesting opinion of the feeding value of gingelly oil cake for milch cattle.
Madras	Asking advice regarding treatment of sick poultry.
Madras	Inquiring regarding the value of Indian corn as food for horses, and the preparation it should undergo before being given to them.
Coimbatore District ...	Asking to be advised regarding the selection of a plough for use by ryots.
Wynaad	Asking opinion regarding leaf disease on coffee trees, probable cause, treatment to be followed, &c.
Tinnevelly	Asking for advice regarding the utilization of waste lands by planting, &c.
Tanjore	Asking for advice regarding the establishment of a Model Farm to be managed by a private association composed of native gentlemen.
North-West Provinces ...	Asking for advice regarding the plough best suited for introduction amongst native cultivators.

10. *Agricultural Apprentices.*—In my last annual report, and in a special report, I directed attention to the very unsatisfactory conditions under which the District Farm Apprentices are placed for gaining a knowledge of agriculture ; it is, therefore, unnecessary again to go over

the same ground here. The following "examination results" will convey a general idea of the kind of information with which these Apprentices are expected to become acquainted :—

—	Full Marks.	A.	B.	C.	D.	E.
District Farm Apprentices' Examination held on the 11th of June 1873.						
Paper Examination.						
1.—The pay of a cooly is 5 Rs. a month of 30 days ; he is absent 8 days ; what pay is due to him ?	10	10	10	10	10	10
2.—A heap of manure measures 8 yards in length, 4 yards in width, and 7 feet in depth ; what are its cubical contents ?	10	10	5	10	10	...
3.—If a plough travels at the rate of $1\frac{1}{2}$ miles per hour, turning over a furrow slice 9 inches wide, what area will it plough in a day of 8 hours, deducting 20 per cent. for turnings at the headlands ?	10	...	5	...	...	...
4.—On 485 square yards of land I broadcast 50 lbs. of castor oil-cake manure ; how many pounds will be required to manure an acre of land at the same rate ?	10	10	...	2	10	10
Vivâ Voce Examination.						
1.—How many coolies will hoe one acre of land in a day of 9 hours, the land being under cotton moderately free and not foul with weeds ?	5	5	1	1	2	2
2.—How many loads of earth from a heap should one man fill and cart to a distance of 1 mile in a day of 8 hours ?	5	2	5	...	4	3
3.—At what rate per hour do the farm-cattle travel when ploughing ?	5	4	2	2	5	...
4.—What medical treatment did the cattle suffering from foot-and-mouth disease undergo ? ...	5	4	5	2	4	...
5.—What has been done during the last few days in field 25 ?	5	5	5	4	5	4
6.—What was the cost of cutting the drains in No. 16 field ?	5	...	2	3	4	2
7.—About how many pounds per acre did the crop of gram fodder in No. 4 field yield ?	5	...	...	...	...	...
8.—How many pounds of cotton will a cooly collect in a day of 9 hours if at the time there is about 60 lbs. per acre on the trees ?	5	...	5	2	2	...
9.—About how many gallons of water does the lift in well No. 13 raise in a day of 8 hours ? ...	5	...	...	...	...	...
10.—What price per cubic yard would you give for excavating earth in No. 14 field (in the present condition of the soil) and conveying it to a distance of 10 yards ?	5	1	2	4	5	4
11.—How many pounds of seed cotton did the cotton gin clean during an ordinary working day ?	5	...	2	2	2	1
12.—What quantity and description of foods are given to the working cattle, feeding cattle, and sheep ?	5	2	2	4	4	2
Total ...	100	53	51	46	67	38

11. It will be noticed that the majority of the questions are framed to test whether the apprentices take an intelligent interest in the work of the farm, as the training, such as it is, to which they are subjected is exclusively field training. The result of this examination is fairly satisfactory ; it was quite impossible that the youths could have prepared themselves specially for it, as the examinations are not held at stated times, no previous notice was given of the intention to hold the examination, and the questions put were framed in the room while the examination was proceeding.

12. Though, making due allowance for the circumstances under which they were placed, these apprentices have done fairly satisfactory, they have made but very little progress towards qualifying themselves to hold District Farm Superintendentships ; however they are not to be blamed on this account, it was decidedly a mistake to suppose that Hindu youths, without any knowledge whatever of agriculture or of kindred subjects, would in the space of three years by mere field employment on the Sydapet Farm , become qualified to hold the Superintendentships of District Farms. Such a training, as I have often pointed out, should qualify them to manage small farms of their own, situated in localities similarly circumstanced to the Sydapet Farms, and it should qualify them for employment as Overseers under efficient superintendence ; but it could not, in reason, be expected to do more than this. Under a good system of theoretical and practical training in the lecture room and the field, there would be no difficulty whatever in training educated native youths thoroughly in agriculture.

13. It has been contended that, because in England and Scotland farm bailiffs undergo no special training, that it is therefore unnecessary in India to place under special training youths who intend only becoming farm overseers ; but persons who view the matter in this light forget the important difference in the early training, habits and circumstances of the men who, in Britain, become farm bailiffs, and of the men who in India would become farm overseers.

14. In Britain the embryo bailiff passes through something like the following stages of employment before he is appointed a bailiff :—On leaving the village school, say at 12 or 13, the youth becomes a ploughboy, and is employed in general farm work until he is, say, 18, when he becomes a waggoner or ploughman ; a year or two later he perhaps is made the foreman ploughman ; his next step in promotion is his appointment as yardman, next his appointment to be foreman in charge of women and field workers ; and, finally, when perhaps nearly 30 years old, he is appointed bailiff. While passing through these various stages in training the man is employed at all kinds of agricultural work ; he meets with but little that is opposed to his early training or prejudices ; he hears good farming favorably spoken of on all sides, and he adopts naturally the improving agriculture he sees generally practiced.

15. How different are the circumstances under which a youth is placed in this country who wishes to become a farm overseer where rational agriculture is practiced. Probably, at 18 he leaves school, when perhaps he possesses a fair knowledge of the English language ; he goes, let me say, to Sydapet to undergo training, where he finds everything different to what he has been accustomed ; he finds implements and machinery in use the names of which he even does not know ; he sees crops growing of which he had no previous knowledge ; he sees manures applied which he never heard of before ; he sees field operations performed when soil and season suit, with a perfect disregard to the opinions of the astrologers of the locality, in respect to "lucky" and "unlucky" days, &c. ; he sees animals purposely fed for slaughter to provide human food, a practice which he at first, from his previous training, looks upon with horror ; in short, to him almost everything around is new, the operations conducted are novelties, and the part he is to take in what is going forward is equally strange.

16. Is it just, therefore, to expect that by undergoing say three years employment in field work on the Sydapet Farms that native youths should become as competent agriculturists as are farm bailiffs in Great Britain ? Hindus and Mahomedans are ready and willing to learn more rational systems of farm management, and will, I have no hesitation in saying, make good agriculturists, farm overseers, farm superintendents, &c., but it is essential to success that the

system of agricultural training under which they are placed should be especially suited to their circumstances.

17. *Improvements, &c., on the Sydapet Estate.*—During the past year the principal roads through the Experimental Farm were entirely re-made with gravel and laterite ; and the grass sidings, which were previously much higher than the roads and caused injury to them during the rains by preventing their proper drainage, were cut down to a level sufficiently low to allow of the surface of the roads being well drained. The work was costly, but the good effect will be experienced for years. About four acres of land rendered almost barren from the ill-effects of swamp cultivation was subsoil drained and restored to a healthy state. A large cart-shed was built at the Experimental Farm buildings, there not having been a cart-shed there previously. This shed consists of a tile roof on palmyra rafters and reepers supported by pillars formed of brick built in lime. A considerable amount of levelling was done in the fields on both the Sydapet Farms. All necessary repairs were done to buildings, bridges, &c., on the estate. A large number of cocoanut trees were planted out that had been raised on the farm from nuts, a number of these were planted around the buildings on the Experimental Farm to afford shade, most of them are growing luxuriantly.

18. *The Wudder Settlement on the Sydapet Estate.*—In the centre of the Sydapet Farm estate there is a plantation of tamarind trees which covers about six acres of land ; in this plantation there are one hundred and fifty leaf-huts occupied by a colony of Wudders, who are said to be the descendants of persons who were brought into the district to work on the estate. When counted on the 23rd of April 1872 these people numbered 201 men, 218 women, and 250 children ; total 669 persons. The ground on which these huts stand is now almost entirely surrounded by cultivated land.

19. The settlement is a very serious nuisance, not only because, from the situation of the huts, many people are brought through the farms during both night and day over whom it is impossible to exercise any control, unless we incur a serious expense in employing a large staff of watchmen, but chiefly because it is a nursery and hot-bed of disease. Health statistics were collected amongst these people from the 1st of August 1872 until the end of June 1873 ; during these eleven months there were twenty-four deaths, and possibly some deaths may have occurred when the people were temporarily residing away from their huts, and may not have been registered. Taking the registrations for the eleven months, the annual death-rate was 38·86 per thousand, a very high rate. During the same period there were 243 cases of illness amongst these Wudders, that is, separate attacks of sickness, each sufficient to prevent the sufferer from attending to his or her usual work ; the names of a few of the people occur more than once in the sick list, but most of the cases were distinct attacks on different individuals varying in duration from one day to 14 days ; making a full allowance for the persons who were sick more than once, it appears that one in every four persons in this settlement was attacked by illness. The sickness generally was dengue and small pox ; the former produced a greater number of cases, but not a greater amount of real sickness, than was experienced in former years when the people were attacked by small pox and intermittent fever of a severe type and by cholera.

20. The entire removal of this Wudder settlement to a healthier and more suitable locality is now, I believe, absolutely necessary. Something could be done to improve the sanitary state of the place where the people now reside, but the cost of effecting any substantial improvement would be great. Thus it would be necessary to take down many of the huts and re-construct them on other portions of the site, a number of trees should be cut down, and the brushwood should be entirely removed ; the waste-water channel, which forms the northern boundary of the site, should be deepened, the numerous cuttings and holes in the ground where the huts stand should be filled up in order to prevent the accumulation of filth, but to effect these improvements a considerable outlay would be necessary, while a large annual expenditure for scavenging &c., would be needed.

21. But such an expenditure would yield no good results if the Wudders belonging to this settlement, when engaged in contract work and residing at a distance from Sydapet, are to be allowed to send here those of their number who are attacked by disease during such absence. Living at these times under conditions so unfavorable to health, and exposed to attacks of contagious diseases by associating in large numbers with others of their class from other localities, they keep the settlement here well supplied with material for the dissemination of disease in this neighbourhood.

22. Instead of spending money in attempting to improve the place where these Wudders reside, it would be much less costly, and better in every way, to purchase a suitable piece of ground of sufficient area and present it to the people as a site for a village, and to pay them compensation for their trees growing on the farm land. In planning a village it would be easy to arrange for the proper distribution of the huts to admit of sanitary matters receiving due attention.

23. This settlement now puts the Experimental Farm to a considerable annual expense ; thus during the year ending the 31st March last its outlay on this account was Rupees 281-1-3, while the income from the rents collected from the people amounted only to Rupees 113-10-0.

24. This colony of Wudders is of but little value in affording labor for the farms ; as a general rule the people prefer to take contracts in connection with roads, railways, tanks, and other extensive undertakings rather than to work regular hours on a fixed daily pay ; it is not, that they can earn throughout the year a larger average daily pay than they could earn on the Sydapet farms, but by excessive labor under contract rates they can make sufficient to enable them to indulge occasionally in the luxury of a few days of idleness ; it is only when there is nothing attractive offering in contracts that we can secure their services, and this is generally only when from the state of the weather excavating and similar work is costly.

25. *Snakes and other vermin killed on the Sydapet Estate.*—During the past year the following snakes, squirrels, and rats were killed on the two Sydapet Farms :—

Cobras	54
Other snakes...	555
Squirrels	70
Rats...	170

The rewards paid are very trifling ; thus we pay for a cobra 2 Annas, for any other snake 1 Anna, for a squirrel 1 Anna, and for a rat ¼ Anna; small as are these inducements they have had a very satisfactory effect ; large snakes are now seldom met with on these farms, whereas about four or five years ago they were very abundant. No deaths from snake-bites have occurred amongst farm employés during the last six years, though several have been bitten ; but during this time two or three persons unconnected with the Farms, have died from bites of snakes inflicted when on farm land.

26. I was warned when I first began to kill all snakes indiscriminately on the Sydapet Farms that the crops would suffer severely from attacks by rats which would increase greatly in numbers ; rats are certainly very troublesome, but not more so than they were before we began to kill the snakes ; indeed, as far as it is possible to judge, I think we have fewer now ; we encourage the presence of the mungoose, of owls, and cats amongst our crops, and these keep down the rats.

27. The only way of keeping down dangerous snakes is to kill all the snakes met with ; there is such a similarity in the general appearance of many poisonous and harmless snakes that it is quite mpossible during the brief time that a snake is in a man's power that he can distinguish whether it is a poisonous or a harmless variety, and any attempt to do this generally results in the escape of the snake. Harmless snakes may serve a useful purpose where there is much prickly-pear and other dense low growth of a jungly character covering the ground, but in open cultivated country, owls, cats, and the mungoose are quite able to keep down the rats.

28 One very clear result of keeping down the snakes is a very large increase of birds on the estate; these may to some extent prove injurious at harvest time, but the good they do at other seasons far more than counterbalances this. Our crops enjoy almost perfect security from attacks of insects, ants excepted. Our summer crops, which generally mature when there are no other grain crops growing in the neighbourhood, are severely attacked by birds, but these come from a distance in large flocks, and are chiefly parrots and wild pigeons. I believe that our field crops suffer far more from squirrels than from rats, and these destructive little creatures are much more difficult to capture; they are especially destructive on crops just appearing above ground, in nipping off young shoots, maize is especially injured in this way. Snakes may to some extent keep down these pests also, but the same would be effected by cats, the mungoose, &c.

29. *Agricultural Exhibition.*—An agricultural exhibition was held on the Experimental Farm in February last; it was the first of a series of similar exhibitions which it is proposed to hold in selected parts of the Presidency. Exhibits were sent to it from each district, also from Travancore and Cochin; its entire management was entrusted to this Department. The land selected for the exhibition grounds was about ten acres in extent; the sheds, which were built to accommodate not only the produce and machinery but also the whole of the live stock, were very extensive, there being in all nearly two acres of roofing; though they were only for temporary use, it was necessary to make the sheds sufficiently substantial to guard against the effects of a sudden storm, while the roofing had to be sufficient to protect visitors from the heat of the sun. Owing to the short time at our disposal for making preparations and the enormous quantity of material required, it was only by the exercise of great exertions that we succeeded in getting ready the accommodation necessary by the date fixed for opening. The exhibition was, on the whole, a success, making due allowance for the difficulties that had to be overcome; but, as I have already submitted a special report, it seems unnecessary to make any further references to the matter here.

30. *The absence of a local demand for superior agricultural productions.*—Much difficulty is experienced in meeting with purchasers for live stock and field produce of a superior kind, if a price is demanded that bears any fair relation to the cost that has been incurred. Until there is a very general improvement in the agricultural practice of this country, this difficulty is likely to continue. Favorable commercial results can never be secured by farmers who raise superior stock and produce (necessarily at a heavy expenditure of time and money) unless they meet with a ready demand at fair prices for such superior productions.

31. The English breeders of stock, who have become famous in all parts of the civilized world from the splendid results they have achieved, would have remained unknown and their skill would have been unappreciated had there not been men equally as intelligent and enterprising ready to buy at reasonable prices whatever their skill produced. The high state of excellence to which certain races of cattle and sheep have been raised, is to be attributed almost entirely to the fact that there existed a ready demand for such excellence, a demand which fully recognized the cost of producing such superiority.

32. Not only is there as yet no demand at fair prices for superior breeding stock or field seeds amongst the so-called farmers of this country, but there is no wholesale demand for properly fattened stock or other superior agricultural productions; the raisers of such having no choice but themselves to retail the produce to consumers, and here, setting aside all considerations bearing on the unpleasant necessity of the farmer having to become a retail dairyman, grain-seller, or butcher, a serious difficulty presents itself, *viz.*, the difficulty of keeping up, from any single farm, a continuous supply of such produce sufficient to meet a regular retail demand; in this country field produce comes in with great irregularity, which must continue to be the case as long as our operations in the field are so materially affected by the weather.

33. There is undoubtedly a market for superior productions suitable for export, provided they can be raised in sufficient quantities. Small parcels receive little or no attention from merchants

unless the prices ruling for ordinary productions of the kind are accepted ; thus the enterprising cultivator, who grows a few acres of Carolina paddy, maize, or New Orleans cotton, finds, when ready for market, that these superior productions will bring him in no more money than those he ordinarily raises, because the local demand cares not for superiority, and, because the quantities are too small for export; this latter difficulty will, of course, disappear as these productions become more generally grown, when also will be generated a demand for seeds for raising these superior crops. It is now exceedingly disheartening to the cultivator who has been sufficiently enterprising to grow one or more of these improved crops to find, as has often been experienced, that the money returns obtained are but very little greater than resulted from the cultivation of the indigenous crops they displaced.

34. While such are a few of the difficulties experienced on first introducing new crops, the difficulties attending attempts to improve agricultural live stock in this country are equally great. I have again and again met with persons who, with creditable enterprise, have purchased good stock, and have gone to much expense and trouble in breeding and rearing the produce of this stock in the hope that at any rate the actual expenditure would have been recovered, who have had to complain that even this modest expectation has not been realized; this was not from any want of judgment in selecting the stock or deficiency of skill in their management, but simply because there was no demand even at moderate prices. The fact is natives generally who, of course, are the only extensive stock-owners in this country, cannot yet be made to comprehend that a well-bred bull which has been properly reared may be much cheaper at 150 Rupees than an ordinary bull reared under their usual management is at 60 Rupees. Early maturity, propensities that will give a large return in milk or in meat for the food consumed, good constitution, shape, size, &c., count for little in their estimation. I do not here allude to animals of breeds that have been introduced, which may not be altogether suited to the present condition of our agriculture, but to superior animals of indigenous breeds.

35. Disheartening as these facts appear to be, they are not less encouraging than might have been expected, seeing how ignorant and prejudiced our cultivators are. In every country reforms are difficult to carry out where they seek to improve customs that have long been in operation, and the improvements that we would effect in the farming of this country go to the very root of customs which have been adopted for generations. Mere self-interest will never effect reforms amongst a people who are uneducated and so superstitious as our ryots ; it is not to be supposed that they are less avaricious than other people, but they have not the intelligence to see what is their own interest.

36. *Fish-preservation.*—The river Adyar forms the boundary of the Sydapet Farm estate no the southern and eastern sides ; the portion thus owned by the estate is about two miles in length with a width of about 25 yards, that is, half its average width, as the claim extends only to the centre of the river. The Adyar drains and flows through a very poor country ; the greater part of its water is the overflow and wastage of several large tanks situated some miles to the west of Sydapet ; its flow is perennial, though very slight in the hot season. During September, October, November, and December a large quantity of water passes down, and occasionally the river is very much flooded. Where it begins to form the boundary of the Experimental Farm it swells out to a considerable width, and again contracts after passing the farm buildings, thus forming a basin of considerable area, in this its depth varies from four to twenty feet ; as it flows eastwards its width gradually lessens until at one place it is not more than fifteen yards wide ; here an anicut has been placed, which has had the effect of raising the height of the water on its upper side at the least four feet ; below this anicut the river again gradually widens to about fifty yards, which is about its average breadth for the next mile ; below this, and to the sea, a mile or two further down, it widens considerably. Excepting the anicut just noticed, the channel of the river is quite free from the sea, up to where the river ceases to form the boundary of the farm estate ; but at times when the flow is slight, the sand thrown up by the surf waves, where it enters the sea, accumulates to such an

extent as to block up its channel until a flood in the river again opens it. When the channel is open, the tide comes up regularly all the way to the anicut ; we have thus salt water on its lower side, and fresh water on the upper side ; the level of the salt water at high tide being generally only about three feet below the level of the fresh water, large fish can readily pass up the stream. There is no obstruction whatever to their passage up when the river is flooded, as at such times the surface of the water is perfectly level on both sides of the anicut. If the land on the opposite side of the river could be purchased, as has been suggested, for use as a stock-farm, the whole rights to the river over two miles of its length would thus be secured for experiments in pisciculture. Nothing really satisfactory can be done in utilizing the portion of the river belonging to the estate, until the purchase suggested has been effected, or until the law sufficiently protects fish.

37. I have endeavoured during the past four years to protect the fish in our fresh water from wanton destruction. The result has, I consider, been very satisfactory. I had a portion of this water netted in the beginning of last year and found that there was an abundant stock of fish, some hundredweights having been brought ashore ; the variety of fish most common was one resembling very much an English roach known to natives as "Sale;" it is a handsome fish averaging from 1½ to 3 pounds in weight ; another variety very abundant was a fish known to natives by the Tamil name "Aery Valay ;" it is a long fish varying in length from 20 to 30 inches, and weighing from four pounds up to seven pounds, both of these varieties are highly esteemed by natives.

38. There is at present, I believe, an enormous waste of human food by the reckless way in which our tanks and rivers are fished ; the majority of the nets used are not more than a quarter of an inch wide in the mesh, while many nets are used of a much smaller mesh, consequently a large quantity of young fish are taken with those of a more useful size, the best are selected, and those too small to be of use are rejected and left on the spot where the net is emptied. I do not remember ever having seen a native fisherman return to the water the small fish not required by him, all act with perfect disregard to the future ; unfortunately the anicuts, weirs, and other impediments in the channels of rivers made for irrigation purposes have rendered it much more easy for the fishermen of the present day to slaughter fish than formerly was the case.

39. *The Field-Laborer.*—One of the first results that will be secured by the gradual adoption of a better practice in Indian agriculture will be an improvement in the condition and prospects of field laborers. At present the condition of this numerous class of people is most unsatisfactory ; not only are their individual earnings exceedingly small, but they are very irregular in amount. In the best seasons of the year the income of the field laborer is but just sufficient to meet the requirements of himself and family ; in unfavorable seasons, these people are in a very destitute state.

40. The ryot employer of labor treats his employés like he treats his cattle ; at the end of the cropping season, or when the weather is unpropitious for out-door employment, he turns them away to depend on their own resources. In most parts of the Presidency the laborer is generally paid in field produce. In the neighbourhood of Madras the annual remuneration given to an adult field laborer, in the employ of a ryot, is two Pagodas, or seven Rupees, and one cloth yearly, and three meals of food per diem. When the laborer is sick the daily supply of food is stopped.

41. On the Sydapet Farms the laborers are paid at the rate of five Rupees per mensem for ordinary men and six Rupees per mensem for ploughmen, but they are paid only when actually employed. Excluding Sundays, most of them lose one month in the year from attacks of fever and other sickness ; the total income earned by the ordinary laborer is, therefore, in most instances, only about four Rupees per mensem, out of which it is frequently necessary to pay house-rent. Sometimes the wives of the laborers work in the field, but their earnings on an average in the year will not add more than a Rupee per mensem to the earnings of their husbands, in such instances bringing the total income of the family up to say Rupees five per mensem, with which must be purchased everything needed.

42. The frequent attacks of sickness to which people of this class are exposed, and the absence of all income at such times keeps them nearly always in debt to the bazaarmen. During an outbreak of disease in a district or when food is scarce and dear, it is not at all surprising that such great numbers of these people die.

43. As long as the present low agricultural practice is the ordinary practice of our ryots, there is but little hope of any improvement being made in the condition of their field laborers When, under a more enlightened practice, our ryots begin generally to grow the more valuable kinds of field crops, there will be some hope that the condition of the laborers will be somewhat less miserable than at present.

44. *Live Fences.*—The appearance of the country might be greatly improved if our ryots could be induced to plant live fences around their fields ; such fences would be of use in many ways, they would protect crops from damage by trespassing cattle, they would moderate the force of the wind, and lessen the losses that are sometimes experienced about harvest time from the effects of storms ; they would render the herding of cattle and sheep unnecessary, and be of use in many other ways, but their chief use would be to afford fuel for domestic purposes, the cattle dung now used by the ryot as fuel being set free for use in a legitimate way.

45. There are many kinds of shrubs admirably adapted for forming fences, each suited to the various conditions met with in different parts of the Presidency. One of the most generally useful is the corkapilly (*Inga dulcis*) which resembles the English hedge-thorn very much in general appearance, and which has been grown on a considerable scale on the Sydapet Farms. A hedge of this shrub can be raised at a very moderate expenditure of labor, it is only necessary to dig a trench about 1½ feet deep and 12 inches wide along the line of the proposed fence, and to fill this trench with a mixture of good surface soil and any manure that is available ; when this is done the seed is to be sown, say in three parallel lines at equal distances in the trench. If the seed is put down with the first showers of the monsoon, it will be unnecessary to use water ; if, however, sowing is done in the dry season, which perhaps the ryot will find the most convenient time in the year, he having then no urgent field-work to engage his attention, it will be necessary to apply water regularly until the seedlings are at the least one foot in height ; but good treatment is not lost on a hedge of this kind ; a fence that is properly started is always the least costly to maintain in good order. After the second year the hedge may be cut regularly once a year, and will yield a large quantity of excellent fuel. When established, a mile of such a fence under fairly good treatment in a climate similar to that of Madras will yield annually from 30 to 40 cart-loads of cuttings, most of which would be well suited for use in the house of the ryot. The cutting should be done only after the monsoon has passed over, thus securing the fences, when at their full height, to protect growing crops from the ill effects of the high winds that prevail during the monsoon.

46. *Deep and shallow cultivation.*—Some most mischievous opinions have recently been spread through India regarding the effects of deep cultivation in hot climates ; I feel it my duty, therefore, to state most unreservedly that the result of my six years' experience in actual cultivation in one of the hottest parts of Southern India has convinced me beyond all doubt that the advantage that the Madras farmer will secure by deeply tilling his soil can scarcely be overrated.

47. Shallow cultivation is the curse of Indian agriculture, and the man who can induce the ryot to add an extra inch or two to the depth his tillage operations extend, will be as much entitled to the gratitude of his country, as the man who makes two blades of grass to grow where only one grew before.

48. Now in referring to deep cultivation or deep tillage I do not necessarily mean deep ploughing ; it is here, I believe, where the mistaken opinions before noticed have originated. By deep tillage or deep cultivation I mean that the soil must be deeply stirred or loosened by the cultivator, the subsoil plough, &c. As a general rule all soils will be benefited that are thus

treated; but the case is different with deep ploughing when the soil is unfitted, as there are many soils that would be temporarily injured by being suddenly deep ploughed, such soils for instance as those resting on a tenacious soapy subsoil, which in the process of deep ploughing would be brought to the surface and would render the surface soil unproductive until physical and chemical agencies had again restored it to a condition fit for the growth of crops; and it would be equally as unwise to bring up to the surface, by working the plough more deeply, portions of a subsoil which is poorer than the surface soil, or that is calculated to injure the surface soil in its physical character.

49. As a general rule deeper ploughing should be done gradually, that is, the process of deepening should be the work of time, though there are soils that may be deepened at once without any bad results following. It should be remembered that in deep ploughing the under soil is always brought to the surface, while in deep cultivation the under soil or subsoil remains in its original position, its particles being merely loosened, thus allowing a free passage for air and water.

50. A dry season brings out in a decisive way the results of deep culture; during the long drought experienced last year the maize plants growing on a piece of land on the Experimental Farm that had been subsoil drained in the previous year, were more than twice as large, and proportionately luxuriant that grew over the newly-filled drains, than the plants that grew on the land between the lines of drains, the former during the greatest heat were always remarkably luxuriant, they drew their supplies of moisture far down below the parched surface soil, while the plants on the intervening spaces were puny and sickly, their roots not being able to penetrate more than a few inches below the parched upper soil. Similar results I have always obtained whenever I have had the soil deeply cultivated. I have gradually year after year deepened the cultivation on the Sydapet Farms until the soil is fully 50 per cent. deeper than similar soils under ordinary native farming, and I would gladly go deeper still; indeed I feel sure that we can never secure good average results from our farming until we do cultivate deeper. In the hottest season the crops on the deeply tilled soil are generally fresh and luxuriant in appearance, while those growing on shallow soils are parched and withered.

51. *Want of enterprise in the Ryot as shown by his carelessness regarding the quality of the field seeds he sows.*—Native cultivators pay but little attention to the quality of the seed they sow; this neglect is the result of ignorance or apathy, it cannot be said to be the result of want of means—the too common apology offered for all the shortcomings of the ryot—for in many cases a little personal labor expended in separating the seed is all that is required. The extra cost of the seed for an acre of land of the quality it is advisable to sow would seldom be more than one rupee, while the return obtained from this seed may be many rupees greater than the return from inferior seed.

52. Again native cultivators will persist year after year in sowing seed the produce of their own land, rather than put themselves to the trouble of sending a few miles for fresh seed the produce of soils of a different description to those they cultivate.

53. There are those who profess to believe that the ryot is a sharp-witted man, keenly alive to his own interests, and these persons are frequently informing us that if agricultural reformers could but show the ryot how to make money by adopting improved practices in agriculture, he will be found most ready and willing to receive and act upon any advice given to him; but this is a mere delusion; ignorance, superstition and custom are not less powerful in India than in other countries. More is needed to fit a man to make money than a mere desire to possess it; most people possess this qualification in plenty, yet all are not rich. The fact is, that in no industry, can ignorance and prejudice produce such serious consequences as they do in agriculture. Intelligence and enterprise are essential to success in modern agriculture.

54. The loss that results from the use of bad seed and from thick seeding will, I have little doubt, annually represent a sum equal to, at the least, one half of the sum paid per acre in the form of Government assessment on the arable land of this Presidency; in other words by the

exercise of a little intelligence, and by the expenditure of a small amount of labor, most Ryots holding arable land could reduce their annual assessment fifty per cent.—a result which I should imagine all would be glad to secure—and yet how few there are who could be induced to put in force the means required to produce these results.

55. It is education, not example, that is at present so urgently needed to improve Indian agriculture. Educated intelligent men will follow a good example ; but ignorant superstitious people never will, they prefer to trust to witchcraft, magic, &c.

SYDAPET EXPERIMENTAL FARM.

56. *Cattle.*—With the view of effecting some improvement in the cattle of the district around Madras, it is intended to import a few animals of the Aden breed. One bull, two cows, and two calves have been purchased, for shipment from Aden to Madras by the first favorable opportunity. The Adens have a high reputation as dairy animals ; the name Aden by which they are distinguished has probably originated from Aden being the port from which cattle of this breed are generally shipped, they are not found in the neighbourhood of Aden, but are brought from districts situated at considerable distances from the coast. They are small animals, and the bulls of the breed are therefore better suited for use in the early stages of experiments in improving the breeds of small cattle generally found in Southern India than are bulls of the Nellore and Mysore breeds, which in some instances have been used for this purpose. To show how great a mistake it is to use bulls of these large breeds in attempting to improve the cattle of Southern India, it is only necessary to mention that a cow of an average size generally weighs from 200 to 300 lbs. live weight, while a good bull, of the Nellore, or Mysore breed will weigh from 900 to 1,000 lbs.

57. In attempting to improve breeds of cattle, great care should be exercised in order that the increase in size bears a strict relation to the supply of food available. In most parts of this Presidency during the dry months, even in a moderately good season, the food available is scarcely sufficient to preserve the lives of the undersized cattle kept by ryots, and would, therefore, be totally inadequate to do even this much for animals of a larger size.

58. Before taking steps for improving the size of the cattle in the more backward parts of the Presidency, it is necessary that something should be done to induce ryots to grow fodder, &c., as food for their live stock. As long as so many ryots consider that it is more economical to allow their cattle to starve or even to die in the dry season rather than to go to the trouble of growing fodder for their use, it will be exceedingly unwise to attempt to increase the size of the cattle they keep.

59. The increase in the size of the draught cattle of Southern India is highly to be desired ; greater size means more strength, deeper cultivation, better crops.

60. Native cattle like native laborers can adapt themselves readily to the bad conditions with which they have so frequently to contend. A cooly, while work is abundant and food cheap, takes his three meals per day ; as the work becomes less abundant or food dearer he reduces his allowance to two meals per day, and he will manage to exist even on one meal per day when out of employment or food is very dear. The starving process is gradual ; the people become accustomed to it. It is the same with cattle ; they can be starved down to, and be kept alive, for a time, on a daily allowance of food that would represent only a tithe of the quantity they could consume when in full health. This is the ordinary process to which they are subjected every hot season at the hand of their owners. But while it is possible to reduce gradually the daily food of a bullock until in amount it would not be one-tenth of the allowance that should be given, it is not so easy again to increase without injury the daily allowance of food to the quantity necessary to support the animal in health ; hence the enormous losses that are experienced in this country amongst live stock when after a long drought a sudden fall of rain produces a luxuriant and plentiful

growth of grass. Few cattle die directly from starvation; the deaths in most cases are the result of the sudden supply of succulent food in abundance, greedily eaten by animals whose constitutions have been weakened by a long and gradual starving process.

61. It has been suggested that a stock breeding and dairy farm should be attached to and worked in connection with the Experimental Farm ; to be employed as a portion of the Educational Machinery to be used in training agricultural pupils. It is certainly very desirable that due attention should be given to stock breeding and dairy farming here, not merely for the reasons given, but also because these important branches of agriculture greatly need attention, and they will never receive proper attention until Government has led the way and shown in what direction improvement can be effected.

62. Fortunately there is a piece of land available, measuring about 300 acres which is separated from the Experimental Farm only by the river Adyar. It is true that the river when in flood will prevent intercourse between the two farms excepting by means of the bridge at Sydapet, but this would only be for a few days in the year, and would be but a trifling inconvenience in comparison with the advantages that the proximity of the river confers on the site. The land is not at all of the quality I should select for a grazing farm ; a portion of it is a good average soil, but much the largest area is very inferior. The great advantage the site possesses is its proximity to the Experimental Farm, thus rendering it unnecessary to erect special farm buildings, and enabling the undertaking to be managed under the direct control of the officer in charge of the Sydapet Farms. The land is capable of much improvement, and this improvement could be effected at a cost sufficiently moderate to justify the expenditure, provided the land can be purchased at a price bearing a just relation to its present condition.

63. The operations of such a farm might begin by buying up the best of the calves born in Madras, of which there are a great number every year, most of which are at present turned to no useful account. The cows are in most instances the property of residents whose only anxiety is to get as much milk as possible. As many of these cows are good specimens from the best districts, while a small number are animals that have been imported from Australia, their calves are well worth attention, and they could, I think, be purchased at very moderate prices.

64. After the undertaking has been organized, attempts might then be made to establish a herd suited to the requirements of the district.

65. Probably in the good grazing districts of the Presidency in Salem or Nellore, better results might be obtained in stock breeding than at Sydapet, and it might be well in these districts to start some such undertaking ; but we need to commence our educational work at once, and we seem to have in the land referred to many important advantages which a site in the more remote parts of the Presidency would not possess. It seems unnecessary to refer to this matter at greater length, as I have already prepared a separate report on this subject.

66. *Sheep*.—The sheep breeding experiment continues to progress in a satisfactory way. There is a decided improvement in the quality of the wool now obtained from our sheep ; when we commenced the experiment the wool yielded by most of them was exceedingly coarse and almost quite straight ; it is now finer and is a great deal more curled. There is, of course, very much yet to be done before the average quality of the wool is even moderately good, but the improvement that has been effected is very encouraging.

67. At one time I feared that in this hot climate but little could be done towards improving the quality of wool ; but though the intense heat is a great drawback we possess one advantage over people resident in a cold climate in being able to grow crops throughout the year for the use of sheep, and this is a very important advantage in wool growing. When sheep are alternately starved and overfed, their wool is always very irregular in strength and quality, the portion of the staple produced during the period when food was scarce being always weak.

68. As our experiments have shown that we can produce green food throughout the year, I now see no reason why we should not ultimately produce fine wool ; it must be remembered that

some of the finest wools produced in the world are grown in countries in which the temperature has a high average range; for instance in Spain, Southern Germany, the Southern States of America, the Northern Districts of Australia, &c.

69. It will, of course, take a long time to produce a fine wool from the Sydapet breed of sheep; but by judicious crossing with fine wool-producing breeds that will stand the intense heat experienced in Madras during the hot season, we may bring about the desired results in much less time.

70. I hoped that the Chinese breed of sheep would have proved useful for this purpose, and accordingly obtained recently from China three ewes and two rams, but they will not, I fear, be able to encounter the heat of Madras; they already seem to suffer greatly. The wool of these sheep is very much superior to anything that we have yet produced at Sydapet; we may, therefore, hope if these Sheep, live to effect some considerable improvement in the quality of our wool. It is chiefly in the wool that these Chinese sheep are superior; they are not better animals for the butcher than are the Sydapet sheep, and their broad flat tails do not add to their value. If these imported sheep live, experiments will be made by putting the rams to a few selected ewes of the Sydapet breed, while a ram of the Sydapet breed will be put with the ewes of the Chinese breed. I hope that the latter cross will result in the production of lambs with tails of the ordinary size, as the heavy flat tail is a great disadvantage, it so frequently becomes diseased.

71. *Pigs.*—Four pigs, two boars, and two sows were recently imported from the south of China, and are now on this farm; they, like the Chinese sheep before alluded to, appear to suffer greatly from the heat. There are two principal breeds of pigs in China, a large and a small breed; it is the latter that we have introduced. The pigs kept at this farm are rather too large for killing as pork; it is hoped that a cross with the Chinese will result in a variety more suited in size to meet the general demand.

72. If pigs receive proper attention, there is, I believe, no more useful agricultural stock in this country. As generally managed by natives, pigs are the scavengers of the village; hence the disrepute into which country pork has fallen. It should, however, be generally known that the cattle and sheep of the ryot, when kept in a half famished state, are quite as filthy in their habits. Pigs that are properly housed and fed are almost as cleanly in their habits as are cattle or sheep under similar condition.

73. I have before recommended pigs as suited for keeping to supply the wants of European households on coffee estates and in other places where it is almost impossible to get butcher meat fit to eat, and I would again direct attention to the matter; pigs can be reared under conditions quite unsuited for rearing sheep, and under artificial feeding a pound of pork can always be produced at a cost very much lower than a pound of mutton.

74. *Cotton.*—When I first attempted to grow cotton on this farm, I was frequently informed that the experiment could yield no good results, as it had been ascertained beyond all doubt that the climate of the district was altogether unsuited for the healthy growth of this plant; while general experience had proved, in an equally conclusive way, that cotton could not be raised on a poor sandy soil such as that which forms so considerable a proportion of this farm.

75. This opinion was very general, thus the Collector of Chingleput in a report to the Board of Revenue, dated 7th June 1869, explaining why he had failed in getting any cultivator to take some cotton seed which had been sent to his office for distribution, says: "Due notice was given in the District Gazette, and the various farmers and proprietors were invited to apply for the seed, but no applications were received, the fact being that in this district little or no cotton is grown, the soil being quite unfitted for it." Again the Honorary Secretary to the late Farm Committee, in a report, dated 23rd June 1869, explaining to the Board of Revenue why certain cotton seed sent by the Board for experimental cultivation had not been sown, says: "The soil of the Government Experimental Farm at Sydapet is of a very sandy description, and the Committee considered it was useless to try the experiment of growing cotton."

76. I was, however, not satisfied to let the matter rest here. I believed that far too much trust was placed in the opinions expressed by the ryots of the neighbourhood; I found on comparing the meteorological registrations of the district with those of the regular cotton-growing districts that there was nothing in the climate prejudicial to the growth of cotton, while the soil, though very much inferior to the so-called cotton soils, could, I believed, by the aid of manure, be rendered sufficiently fertile.

77. My first experiments were made on a small scale; the results afforded were very encouraging. I repeated the experiments again and again, each time on a larger scale, and now cotton is one of the ordinary crops of this farm. The variety I prefer is the New Orleans; it is especially suited for high cultivation to which it has long been subjected; a dressing of manure that would be necessary to render our inferior soils fit for producing cotton would cause plants of the indigenous variety to run to stem and leaf instead of increasing the yield; whereas the yield of the New Orleans plant under similar circumstances would be largely increased.

78. It is true that on inferior soils such as we have here cotton cannot be raised without the aid of manure, whereas on the more fertile soils of the districts in which cotton is grown it can be produced without manure; but the yield is always very small, seldom more than one-fourth the quantity that could be raised on the same soil if properly cultivated and manured. On the Experimental Farm, crops that have yielded 200 lbs. and upwards of clean cotton per acre have repeatedly been produced, while the average produce in the cotton districts is only 75 lbs. of clean cotton per acre.

79. There are thousands of acres of land around Madras in no way inferior to the soils of this farm, now lying bare during two-thirds of the year, and during the remainder producing wretched crops of varagoo and horse gram, which might be made to yield remunerative returns under cotton; the extra expense on cultivation and manure would be morethan counterbalanced by the smaller cost of conveying the cotton to the shipping port.

80. I have in former reports given full and minute details of the cultivation, &c., of the experimental cotton crops which have been grown here, but I have not been able until now to place on record anything showing the *quality* of the cotton raised further than what could be gathered from the price obtained in the local market. I was enabled through the kindness of Messrs. Walker & Co. of Madras to forward to England for sale three bales of cotton that had been grown on this farm on a soil containing nearly 90 per cent. of sand. The following correspondence refers to this cotton:—

To W. R. ROBERTSON, Esq.,
Supt. Govt., Farms, Sydapet.

DEAR SIR,—WE beg to hand, herewith, extract from letter received by us yesterday from our London Office, giving Brokers' report and valuation of the three bales cotton received from the Government Farm and shipped by us per *Sultan* to London. You will observe the staple is complained of as "weak," and we think this is owing to its having been torn in the process of ginning. We might mention that while your cotton is valued at $6\frac{5}{8}d.$ per lb. we have sales of Fair Western's by same mail at 6*d.* per lb.

MADRAS,
17*th November* 1873.

We are, &c.,
(Signed) WALKER & Co.

"We hand you as under our Brokers' report upon the three bales cotton per *Sultan*. G. F. W. Co.

"We have carefully examined the sample of three bales cotton ex *Sultan* at Madras, and find it to be of an useful description of Salem character, ginned, fair color, silky, but rather weak staple, and worth about 6⅝*d.* per lb.

"This is the value which cotton of this quality would command to-day were it here in any quantity, say 50 or 100 bales. The color is good and the cotton is clean, but our Brokers complain that the staple has been somewhat injured; they presume in the process of ginning.

"I have ordered the three bales to be sold by public auction with other cotton, as the best means of ascertaining its value. But in this small quantity it is less valuable than in a lot of 50 or 100 bales."

LONDON,
24th October 1873.

(Signed) WALKER & Co.

81. Unfortunately at the time the cotton reached London the markets were unusually low, or the price realized 6½*d.* per lb. would have been higher, still in comparison with the rates then prevailing the price obtained was very satisfactory; the following are the rates at the time for other varieties of cotton :—

Variety.	Price per lb.
	d.
Tinnevelly	6½
Dhollera	$6\frac{1}{16}$
Western	6
Cocanada	5⅞
Bengal	3⅞
Rangoon	4
American cotton, New Orleans	8½

82. I find that there is a considerable improvement in the quality of the cotton produced on the farm; it is both longer in the staple and more soft and silky than the cotton raised in our first experiments in 1871-72 when the seed was newly introduced.

83. The following results show the quantity of clean cotton now obtained from the New Orleans seed cotton :—

Date ginned.	Seed Cotton ginned.	Clean Cotton obtained.	Yield of clean Cotton per 100 lbs. of Seed Cotton.
	lbs.	lbs.	lbs.
August 10th	229	73	31·88
,, 28th	409	130	31·78

The average yield of 31·83 lbs. of clean cotton for every 100 lbs. of seed cotton is very satisfactory, seeing that the best indigenous cotton does not yield more than 25 lbs. of clean cotton for every 100 lbs. of seed cotton.

84. The Egyptian cotton plants to which I referred in my last report are still growing; judging from their present appearance they will retain their full vigor much longer than plants of the New Orleans variety. I have now had another year's experience in growing Egyptian cotton, and see no reason to alter the opinion I formed at the end of my first year's experience, viz., that this variety is a more expensive crop to grow than New Orleans. As I before pointed out it is impossible to use cattle in a field of Egyptian cotton unless the plants are growing in lines very far apart, as the branches instead of growing upwards like those of the New Orleans plant grow chiefly in a horizontal direction. Perhaps by careful pruning during a few years the

plants may be induced to grow in a more upright way. From the length of time the cotton crop is on the land frequent cultivations are required during its growth, while as weeds spring up so freely, under the light shade afforded by the cotton plants, frequent weedings are also very necessary, and the cost of performing these operations is nearly doubled if manual labor instead of cattle power is used. The yield of cotton obtained from these plants during the last year was small, but to some extent the character of the season would account for this. In the ease with which this cotton can be separated from its seed, it possesses one advantage over all the varieties of cotton that have yet come under my notice.

85. I fear very much that we will lose the variety of cotton known as the Yca Valley to which I have so frequently referred in former reports, the borer before noticed continues to commit great havoc amongst the plants, the shrubs have again and again been pruned of all their affected branches, which have been collected and burnt, but in spite of every effort the borer has continued its depredations, and many of the plants are now reduced to little more than bare stumps; the ground on which they are growing has been thoroughly cultivated and various manural dressings have been applied, but the effect was only to stimulate the growth for a time the extra luxuriance produced, apparently only affording greater scope for the depredations of the borer; we may succeed in getting rid of this pest, but if we do the seed raised from these plant in their debilitated condition will scarcely be fit for distribution.

86. The Yca Valley cotton is undoubtedly a very valuable variety; it would be well if a supply of fresh seed could be obtained from Brazil; it is not likely ever to become one of our ordinary field crops; but as Indian agricultural practice improves, this variety of cotton would take its position amongst our more valuable crops.

87. *Maize and Cotton.*—The following details refer to the cropping of the field that was recently drained, noticed under heading "subsoil drainage" in another part of this report, where will be found all details referring to the drainage operations performed.

Plot (a).

Drained by stone drains.

Area of plot, 8,800 square yards.

Preparation of the soil, &c.—The soil after being thoroughly worked and cleaned was ridged. Blood manure (a compost formed of ashes and the refuse of the slaughter-house) was then spread between the drills, the total quantity used was 36 cart-loads. The ridges were next split by the plough, one-half falling over the manure on either side, thus forming new ridges with the manure beneath, these ridges were next consolidated by the chain harrows when the land was fit to receive the seed.

Seed, &c.—On the 17th of September the whole of the plot was sown, the seed being placed on ridges which were about 30 inches apart. A line of cotton was sown alternately with a line of maize throughout the whole plot. The quantity of seed sown was :—

Maize 8½ pounds.
Cotton 8½ ,,

After cultivation.—During the growth of the crop the land was ploughed twice and hand-hoed three times.

Harvesting, &c.—The maize matured and was ready for gathering in the middle of December. The cotton crop was longer in coming into bearing, and as the weather was so exceedingly dry several months passed over before the whole crop was gathered. The maize yielded 4,147 cobs; and from the cotton plants 299½ lbs. of seed cotton was collected. When dry four of these cobs on the average yielded one pound of clean maize; one hundred pounds of the seed cotton yielded on the average 31½ pounds of clean cotton. The weight of the straw, cob skins, &c., were estimated, but these estimates were based on actual results.

88. The following statement shows the financial results of the experiment calculated per acre :—

Expenditure.				RS.	A.	P.
Ploughing and cleaning the soil ...				3	0	0
Ridging ...				0	8	0
Ten tons of blood manure ...				10	0	0
Carting and spreading manure ...				2	0	0
Splitting ridges ...				0	8	0
Chain harrowing ridges ...				0	2	0
Seed and sowing ...				1	0	0
Chain harrowing ridges to cover seed ...				0	2	0
Cultivation during growth.						
Two ploughings and three hand-hoeings ...				6	0	0
Scaring birds, &c., at harvest ...				1	0	0
Average cost of harvesting Maize.	RS.	A.	P.			
Gathering cobs ...	1	8	0			
Carting to sheds ...	0	6	0			
Peeling, tieing, hanging, &c. ...	1	8	0			
Shelling ...	0	8	0			
Reaping and carting straw to yard ...	1	12	0			
				5	10	0
Gathering and ginning cotton ...				7	0	0
				36	14	0
Income.						
570 lbs. of maize seed at 30 lbs. per Rupee ...				19	0	0
52 lbs. of clean cotton at 120 Rupees per candy ...				12	7	8
112 lbs. of cotton seed ...				2	3	10
793 lbs. of cob stalks, skins, &c. ...				1	15	9
2,956 lbs. of straw ...				13	3	2
				48	14	5
General Result.				Per.	Acre.	
Income ...				48	14	5
Expenditure ...				36	14	0
				12	0	5
Deduct annual charge for drainage ...				4	0	0
Margin to pay rent, interest, superintendence, &c. ...				8	0	5

This surplus might fairly be increased to Rupees 12 by adding Rupees 4 to represent the unexhausted value of the manure used.

(*Plot b.*)

Drained by two-inch pipe drains.

Area of plot, 8,742 square yards.

Preparation of the soil.—The soil was prepared in the same way as the soil of plot (*a*). Twenty-one cart loads about 10½ tons of blood manure and 54 parahs of lime were applied to the plot.

Seed, &c.—On the 4th of September the plot was sown, 11 lbs. of maize and 9 lbs. of cotton seed sufficed for sowing the whole plot. The sowing was effected in the same way as described in referring to the sowing of plot (*a*).

After cultivation.—Two ploughings and four hand-hoeings were all the after cultivations performed.

Harvesting.—The maize did not mature until the beginning of January ; the cotton was not all gathered until several months after. The maize yielded 5,728 cobs, and the cotton yielded 404½ pounds of seed cotton. The yields of clean maize and of clean cotton were very similar to the yields obtained from the produce of plot (*a*) ; and the weight of straw, &c., were calculated from the data used in calculating the weight of straw, &c., in plot (*a*).

89. The following statement shows the financial results of the experiment calculated per acre ;—

	RS.	A.	P.	RS.	A.	P.
Expenditure.						
Ploughing, cleaning the soil				3	0	0
Ridging				0	8	0
5¾ Tons of blood manure compost				5	12	0
27 Parahs of lime				7	14	0
Carting and spreading manure				3	8	0
Splitting ridges and ridging				0	8	0
Chain harrowing ridges to consolidate the soil				0	2	0
Seed and sowing				1	0	0
Chain harrowing to cover seed				0	2	0
				22	6	0
Cultivation during growth.						
2 ploughings between rows of plants } 4 hand-hoeings. }				7	8	0
Scaring birds, &c.				1	0	0
Average cost of harvesting Maize Crop.						
Gathering cobs	1	8	0			
Carting	0	6	0			
Peeling, tieing, hanging, &c.	1	8	0			
Shelling	0	8	0			
Reaping	1	0	0			
Carting straw	0	12	0			
				5	10	0
Gathering cotton, ginning, &c.				10	0	0
				46	8	0

Income.	RS.	A.	P.
793 lbs. of maize seed at 30 lbs. per Rupee	26	6	11
70 lbs. of clean cotton at 120 Rupees per candy	16	12	10
153 lbs. of cotton seed	3	1	0
1,104 lbs. cob stalks, skins, &c.	2	12	2
4,112 lbs. of straw	18	5	9
	67	6	8

General Result.	Per Acre.		
Income	67	6	8
Expenditure	46	8	0
	20	14	8
Deduct annual charge for drainage	3	0	0
Margin to pay rent, interest, superintendence, &c.	17	14	8

To this surplus Rupees 5 may fairly be added as the value of unexhausted manure, making the return Rupees 22-14-8 per acre.

90. Satisfactory as are these results, they do not fully exhibit the benefits in this instance gained by subsoil draining, for it must be remembered that before the drainage was performed the land was almost hopelessly unproductive having been rendered so by swamp cultivation. The stoppage in the stone drains in plot (*a*) during the latter growth of the crop undoubtedly lessened the return that would otherwise have been obtained.

91. With further experience I feel sure that pipes will be found much more suited than stones for use in subsoil draining in this part of India.

92. Throughout the long drought which was experienced during the year under review the cotton on the pipe drained land was always green and fresh, while that growing on the undrained soils was withered and much blighted.

93. I feel no doubt whatever regarding the benefits that will be secured by the subsoil drainage of retentive soils in this part of India, but I believe that we have yet much to learn before we can venture to recommend a system of subsoil drainage for general adoption.

94. *Burmese Paddy.*—A few pounds of each of the best kinds of Burmese paddy were obtained from Rangoon. Each variety was sown on a separate plot of land, the cultivation adopted was precisely that under which indigenous paddy is placed. The general results were not good, a large number of the plants produced small inferior grain, but this may to some extent have been the result of the great change in climate, especially as the crops matured in the early part of the dry season, at which time the dryness of the air in Madras affords a very marked contrast to the state of the atmosphere most common in Burmah. Probably the grain produced by these crops will afford a seed that will yield better results next season. These varieties of paddy are much more highly esteemed by natives than the ordinary paddy generally grown in Southern India.

95. *Shamay* (*Panicum Miliare*) *as a fodder crop.*—A plot of land measuring 744 square yards was sown with 10 pounds of Shamay seed on the 2nd of August. The crop grew rapidly and with great luxuriance ; on the 25th of October, when most of the plants were coming into ear, the whole was cut down, and yielded 4,575 pounds of excellent fodder. This was dried and made into hay which, when cured, weighed 1,411 pounds. After the removal of the first cutting the plants again started vigorously, and on the 18th of December another cutting, weighing 2,673 pounds, was obtained. This, when dried, yielded 925 pounds of hay. The total return thus obtained from the plot during the four months that elapsed between the sowing of the crop and the harvesting of the second cutting was 7,248 pounds of fodder, which gave 2,336 pounds of hay, equal to 47,151 pounds of fodder, or 15,197 pounds of hay per acre.

96. The cultivations, &c., were as follows :—

2 Ploughings.
2 Harrowings.
2 Weedings.
7 Waterings.

Manured with four cart loads of fold yard manure.

97. The cost of the foregoing per acre may be estimated as follows :—

	Per Acre. RS.	A.	P.
Ploughing and other cattle labor	2	8	0
Manure and carting	23	4	0
Seed and sowing	3	0	0
Weeding, &c.	3	0	0
Watering seven times	7	0	0
Cutting fodder, &c.	2	0	0
	40	12	0

or about Rupees 1-14-11 per ton of fodder, a low price.

98. I should remark with reference to these results that during the time the crop was on the ground the rainfall generally was copious, hence it was seldom necessary to irrigate ; had we been obliged to water the crop regularly throughout the whole time it was growing, the cost of producing the fodder would have been largely increased.

99. *Paddy Fodder—green, and dry.*—I have already directed attention to indigenous paddy as a fodder producer. During the past year we grew a considerable quantity of this fodder ; it is readily eaten by all kinds of farm stock ; when produced on land in a good manural condition it is of course much more nutritive than when grown under the conditions that characterize native farming. It is not so well adapted as a food for dairy stock as is cholum fodder ; a milch, cow when consuming daily 45 lbs. of cholum fodder yielded three measures of milk per diem but when paddy fodder was substituted, though a similar weight was consumed, the yield of milk was reduced to two measures ; when feeding with cholum fodder was resumed, the daily yield of milk again rose to the quantity obtained previous to the change of food. This result is not surprising when the habits of the two plants are compared ; the paddy is an aquatic plant, its growth is rapid provided it meets with a sufficiency of organic food in the soil or in the water in which it is growing, a quantity of available plant food that would suffice for the wants of a paddy crop when irrigated would be altogether insufficient to meet the wants of a dry crop ; irrigation water, judiciously applied, enables a plant to utilize thoroughly the food in its neighbourhood, not only by rendering that food more fit for assimilation, but by bringing it within reach of its roots. Dry crops, such as cholum, &c., grow steadily during favorable weather ; as their roots have but a very limited feeding ground, merely the portions of the soil with which they are in contact, it is of the utmost importance for their healthy development that the soil should be rich in plant food, much greater in proportion than is requisite in a soil under a crop of paddy.

100. Under proper manuring and careful watering the nutritive value of paddy fodder might be considerably increased, there can, I think, be no doubt, but that the most nutritive paddy fodder that could be raised would be that produced by the least expenditure of water, especially if the field was occasionally allowed to dry for a day or two in order to admit capilliary action to exert its influence in bringing up to the surface plant food from a lower stratum of soil. Though paddy fodder as generally grown is inferior to cholum fodder, there are many circumstances under which it can be raised more easily, hence its value. For making hay for future use it is decidedly preferable to cholum, not only can it be packed more readily in stacks, but it can be kept in good condition for a much longer period.

101. Paddy hay when made into chaff is a useful food for horses ; the following experiment shows the cost of this hay and the cost of chaff made from it :—

	lbs.
Weight of green fodder weighed two hours after being cut...	4,396
Weight of hay after having been exposed 42 hours, during which time it was repeatedly turned and tossed	1,459

Expenses—

	RS.	A.	P.
Green fodder 4,396 at 400 lbs. per Rupee	10	15	10
Cost of winning and chaffing	3	0	0
Total...	13	15	10
Cost of chaffed hay per ton	13	15	10
Cost of hay per ton	11	15	10

102. *Indigenous Grasses.*—In response to a circular issued from the Board of Revenue a large quantity of seed of indigenous grasses was sent to Madras for experimental cultivation on the Sydapet Farms. Many experimental plots were sown with these seeds, but from various causes the results obtained were unsatisfactory, and but ill repaid the expense and trouble incurred. One chief cause of the want of success was that too much was attempted. I was afraid to keep the seed, the length of time that some would have to be kept, in order to allow of a series of manageable experiments being conducted in succession, and therefore attempted to deal with the whole at one time, sown in upwards of one hundred experimental beds. I soon ascertained that the experiment was far too extensive for the means then at my command, and that it could not receive justice unless by neglecting other experiments. A large quantity of results were collected, which, though unsuitable for report now, will be of use in the further experiments that I intend making; these I propose shall deal only with grasses of one district at a time, instead of with the grasses of the whole Presidency.

103. Another cause of the unsatisfactory results yielded by these experiments was the injury done to the experimental beds by donkeys belonging to dhobies resident in Sydapet. These animals were evidently turned into the field through the gates by their owners, as the fences were in sufficiently good condition to prevent trespass. The donkeys were, of course, captured and sent to the pound whenever seen, but during night many visited the plots, and were removed again before daybreak. Some of these donkeys were captured two or three times a week, and regularly sent to the pound, when they were, with the same regularity, sold, and bought again, probably by their former owners, at from 2 Annas to 3 Annas each, when they again returned to pasture on the grasses growing on the experimental plots. Of course no dhobie could afford to keep up this practice of buying the same donkey two or three times in a week, and to some extent our perseverance in sending the depredators to the pound had a good effect; but in the meantime nearly the whole of our experiments were rendered useless, as we could not report on the comparative yield of plots under different species of grasses which had been grazed to a greater or less extent. To make quite sure that the animals sent to the pound were really returning again and again I had one or two marked, and in this way placed the matter beyond a doubt. I have dwelt on this matter at this length, because it illustrates the annoyance to which many persons are exposed from animals trespassing upon their land; damage may be done to a serious extent by an animal that possesses almost no value, it may in the usual course be sent to the pound, but when there the owner is sufficiently discreet not to claim it lest he should thereby become liable for the damage it has done; he waits until the animal, in the regular course when on owner is found, is put up to auction, when he or a friend, buys it for a few Annas; thus, for the small sum invested in the purchase he avoids having to pay probably many Rupees for damages done. This may seem a small matter to which to direct attention, but it is these small matters that often prove the most annoying, they are so difficult to deal with in a satisfactory way, and I have met with many persons in this country whose attempts, on a small scale, to introduce new crops have been frustrated from the custom, so common amongst natives, of turning live stock, cattle, sheep, goats, donkeys, &c., upon the public roads to seek a subsistence on the pickings there met with.

104. From the more recent sowings I am able to report a few results obtained from the experiments with native grasses; they do not possess much value, but as a step towards a knowledge of the grasses of the country, they will be of use in future experiments.

105. It must be remembered that indigenous grasses, though their appearance above ground, their flowering season, &c., depends on the periodical rains, all possess habits more or less different; hence it was not the best way of bringing to light their individual qualities by owing all in one kind of soil and treating the whole in one way; still, until we possess more infor-

mation regarding the natural habits of the grasses, a comparative trial under similar conditions is the only way by which anything of a useful character can be learned.

106. The soil on which these experiments were made was a light sandy loam ; it was lightly manured, and water was applied once or twice a week according to the state of the weather. The following are the general results :—

Number of Plot.	Area of Plot.	Local Name.	General Results.				
			When sown.	When appeared above ground.	When flowered.	Yield of fodder cut when in flower.	
						Per plot.	Per 100 square feet.
	Square feet.					lbs.	lbs.
1	45	Melampary	4th June.	10th June.	15th July.	15	33
6	$6\frac{7}{8}$	Pooanthu	4th do.	9th do.	15th Aug.	8	116
7	$5\frac{1}{3}$	Vellai Uttaloo ...	4th do.	9th do.	17th do.	5	94
17	6	Shagappu Shamay...	4th do.	10th do.	7th do.	$3\frac{1}{8}$	52
21	$13\frac{1}{2}$	Chinna Arricum ...	4th do.	11th do.	13th July.	$5\frac{3}{8}$	40
23	$17\frac{5}{12}$	Coopary...	4th do.	10th do.	14th do.	$17\frac{7}{8}$	103
24	$13\frac{1}{16}$	Coranee...	4th do.	9th do.	28th Aug.	8	61
25	13	Varashamay	4th do.	14th do.	15th July.	5	38
30	$6\frac{1}{36}$	Peeshachy	4th do.	10th do.	13th do.	20	166
31	$6\frac{1}{36}$	Pelampury	4th do.	10th do.	13th do.		
41	$12\frac{3}{8}$	Yerri Mylampingee.	5th do.	9th do.	12th do.	5	40
49	10	Punjapoo	5th do.	10th do.	5th Aug.	$1\frac{1}{2}$	15
58	9	Ottaray	6th do.	12th do.	1st do.	$1\frac{1}{4}$	14
65	$9\frac{1}{3}$	Corranee	6th do.	10th do.	10th do.	$3\frac{1}{2}$	37
71	$5\frac{1}{2}$	Combapree	7th July.	11th July.	12th do.	$1\frac{7}{16}$	26
75	12	Vematherity ...	6th June.	11th June.	13th July.	$2\frac{1}{2}$	21
83	10	Conally	7th do.	12th do.	1st Aug.	8	80
87	$10\frac{13}{24}$	Chinnyga	8th July.	13th July.	3rd do.	$\frac{9}{16}$	5
90	8						
91	8	Poopillu	8th do.	14th do.	3rd do.	$4\frac{1}{2}$	20
92	6						
100	$6\frac{3}{4}$	Dumapie	7th June.	19th June.	1st do.	$8\frac{1}{2}$	126

Notes thereon :—

Name of Grass.	Remarks.
Melampary	Average height 2 feet 9 inches. Upright growth without bottom grass. When green it yields a fair fodder, but unfit for making hay.
Pooanthu	Average height 2 feet. Upright growth without bottom grass. When young succulent, but wiry when it reaches maturity. Unfit for making hay.
Vellai Uttaloo	Do. do. do.
Shagappu Shamay	Average height 15 inches. Bottom grass abundant ; a moderately good pasture grass ; would afford a coarse hay.
Chinna Arricum	Average height 24 inches. A fair quality of bottom grass. Stems and blades fine, but rather wiry. A moderately good pasture grass. Makes coarse hay.
Coopary...................... ..	Average height 24 inches. A coarse grass ; almost useless for pasture or for making hay.
Coranee.........................	Average height 24 inches. Destitute of bottom grass. Affords a moderately good fodder, but unsuited for making into hay.
Varashamay...	Do. do. do.

Name of Grass.	Remarks.
Peeshachy....................	Average height 2 feet 9 inches. No bottom grass ; yields a moderately good fodder ; too coarse for hay.
Pelampury	Do. do. do.
Yerri Mylampingee	Average height 12 inches ; a fair quantity of bottom grass ; yields a coarse fodder.
Punjapoo	A useless grass.
Ottaray	Average height 12 inches. Has an abundance of bottom grass. Is a moderately good pasture grass. Affords hay of fair quality.
Corranee	Average height 15 inches. No bottom grass. Very wiry ; unsuited for pasture or for hay.
Combapree	Average height 12 inches. Blades coarse and short, but very succulent. Would make a useful pasture grass. Too coarse for hay.
Vematherity	Average height 30 inches. A coarse inferior grass.
Conally	Average height 15 inches. Blades short and pointed. A coarse wiry grass of little value.
Chinnyga	Do. do. do.
Poopillu	Average height 9 inches. A fair amount of bottom grass. Blades and stem tough and wiry.
Dumapie	Average height 30 inches. No bottom grass. Affords a coarse but succulent fodder. Too coarse for making into hay.

107. *Field Vegetable Crops.*—It is exceedingly difficult, in this country, in regard to many crops to determine whether they should be classed as agricultural or garden crops. When I first took charge of the Sydapet Farms I was inclined to rigidly exclude from our attention all crops that did not, beyond all doubt, belong to agriculture ; while I still hold the opinion that in an agricultural undertaking it is well to avoid all vegetable crops that strictly belong to horticulture ; I now think that we may advantageously, in the dry season, give some attention to such crops as plantains, brinjals, sweet potatoes, and one or two other crops of the kind which can be grown on a large scale. There is every year a few months during which there are but few field crops on the land needing attention, and it fortunately happens that this occurs at the time of year when these crops are in season. Crops of the kind referred to consume a large amount of labor, but the return obtained from them is generally satisfactory. They are chiefly valuable to the farmer in enabling him to give regular employment throughout the year to his laborers, a result which is beneficial alike to the laborer and his employer.

108. *Mixed Plantation of Cocoanut and Casuarina Trees.*—A plot of waste land consisting of poor sandy soil, measuring 1,190 square yards, was planted with cocoanut and casuarina trees, partly to utilize the ground, but chiefly as an experiment in view to ascertain the effect on cocoanut and casuarina trees of a moderate dressing of manure. A line of cocoanut trees and a line of casuarina trees six feet apart were planted alternately over the whole plot. The dimensions of the pits for the cocoanut trees were width each way 24 inches, and depth 27 inches ; the pits for the casuarina trees were 18 inches deep and 18 inches wide in each direction. The cocoanut trees had been raised on the farm from nuts ; the trees were fifteen months old when planted out ; they were planted 12 feet apart in the lines. The casuarina seedlings were about three months old, and were bought from a nursery-man at Rupees 5 per thousand ; they also were planted with intervals of 12 feet between each. The planting of the ground took place on the 11th of February 1873 ; there are 134 trees on the plot of which 69 are cocoanut trees. From the time of planting until the 31st of March last the ground has been irrigated twelve times and hoed five times. At the time of planting each pit was manured, four cartloads of blood manure being used for the whole plot ; in February 1874 each tree was manured with two pounds of oil cake, the casuarina trees were pruned nine months after planting, and again in the following March. A few of the trees having failed, they were replaced by seedlings in November last.

109. The appearance of the trees is most promising; their further treatment will be carefully placed on record; it is very desirable that something should be done in order to provide fuel at a moderate price, and in this way set free cow-dung, &c., for use in manuring the soil, instead of as at present, being used as fuel.

110. *Results of inquiries in other countries for crops suited for field cultivation in the Madras Presidency :—*

China.—I am under great obligations to Messrs. Arbuthnot and Co. of Madras for putting me in communication with Messrs. Jardine, Matheson, and Co. of Hong-Kong, from whom I have received much valuable aid. The following extract from a letter received from these gentlemen conveys much useful information, the letter was written in reply to an application I had made to them per Messrs. Arbuthnot and Co. for a small supply of pulses and clovers, or other field-seeds suited for culture in Madras :—"We much regret that we cannot meet Mr. Robertson's wishes as regards a selection of agricultural seeds, for we know of no pulse or clover in China that would prove of much service to him. The beans produced in the Northern Provinces are grown chiefly for the oil and cake they yield, the latter being used extensively throughout the sugar-producing districts of the south. As regards clover, we are only aware of a very coarse description, which is grown to a limited extent around Shanghai, and is almost exclusively used for ploughing into ground intended for wheat or barley."

111. *Burmah.*—An application was made to a gentleman resident in Burmah, who is well acquainted with that country for a supply of field-seeds of the kinds usually cultivated by the Burmese. The following is an extract from his letter in reply:—"I think that I may say that we have no grain-crops in British Burmah in field cultivation except paddy, and the varieties of it can be counted by hundreds." He very obligingly sent a small supply of paddy of two or three of the varieties most highly esteemed. These reached Madras in good condition, and were cultivated in the way usually adopted with ordinary paddy. Though in each case a full average crop of straw was produced, the yield of grain was very light, many of the ears being quite without grain. Had these crops been sown before the full burst of the north-east monsoon, the results might have been more favorable. It is, I think, probable that these kinds of paddy would thrive better in Malabar and on the western side of the Presidency than here on the Carnatic side, where the air is generally very dry. As these varieties of Burmese paddy produce a rice that commands in the local market a much higher price than the rice of the kinds of paddy usually grown in Madras, they are well worth the attention of cultivators who reside where a favorable climate is found.

112. *Mauritius.*—Small supplies of lentils and maize were received from Mauritius in response to an application for field-seeds. The lentils are highly esteemed in Mauritius, but unfortunately they did not thrive on the Experimental Farm, where they were sown. The seed was fresh and germinated well, but the plants never exceeded six inches in height; they flowered, but yielded no pulse. The experiment should be repeated; it is very desirable that something should be done towards introducing a good pulse crop into this part of India. The maize grew admirably and yielded very heavily; from 125 pounds that were sown on the Experimental Farm 5,000 pounds of clean seed were obtained.

Oil Cake.

113. *Ground-nut Oil Cake.*—I mentioned in my last annual report that the price of this oil cake had risen more than 50 per cent. in Madras and in the districts around since I first directed attention to its qualities, and that I was, therefore, obliged to seek for supplies for the Sydapet Farms in localities, where the qualities of the cake had not yet become generally appreciated. I also mentioned that I had succeeded in making a contract in Mysore for 10,000 pounds monthly at Rupees 6-12-0 per candy of 500 pounds. Unfortunately, of the first supply, 20,000

pounds, received under this contract, I was obliged to reject 8,000 pounds, as the cake, instead of being made entirely of ground-nuts, contained a considerable quantity of the crushed seeds of a purgative oil seed ; indeed, the whole of the cake received was impure, but in the cake retained there was a much less quantity of the impurity ; but, small as this was, our stock suffered severely after eating the cake. I ascertained, on making inquiries, that it is almost the universal custom in Mysore to crush with ground-nuts two or three other kinds of oil seeds, under the impression that the mixed oil is more valuable than the pure oil of the ground-nuts ; and, as the oil seeds, that are added are more or less purgative in their action when eaten, it is easy to understand why the cake should prove hurtful to stock fed on it. As the contractors stated that it was quite impossible for them to obtain pure ground-nut oil cake in Mysore, I was obliged to cancel their contract.

114. After some trouble I found a contractor willing to supply pure cake from Vellore on the terms on which the Mysore cake was to be supplied. I have now received regularly 10,000 pounds of the Vellore cake monthly, and have had every reason to be satisfied with its general quality.

115. I have referred to these matters as, during the past year, I have had a good deal of correspondence with gentlemen in different parts of the Presidency who have tried the cake in their stables and byres on my recommendation, and in several instances have obtained results the reverse of satisfactory. In the Tanjore District a gentleman, who attempted to feed his horses and cattle on ground-nut oil cake, found that the cake was eaten most reluctantly by all the animals, and that, after continuing in its use for some time, the animals gradually lost flesh. I obtained a sample of the cake used, and found it to be perfectly pure ground-nut oil cake, but it was thoroughly saturated with oil from imperfect extraction ; though the oil has a sweet, agreeable taste when fresh, it is when rancid exceedingly disagreeable, and as this rancidity is developed during the time the cake is being steeped for use, it is easy to understand why the cake was so disliked by the stock, and the presence of the oil in such large quantities would render the cake slightly purgative. It was only necessary that the oil should have been more thoroughly extracted to have made the cake a really first-class food for stock. Correspondents resident in Mysore have complained that ground-nut cake, when given to young horses, affects the action of their kidneys to an injurious extent, but the results, already noticed, of my experience with Mysore cake sufficiently explain why this is so. To one gentleman who made this complaint I forwarded a sample of pure Vellore cake with a request that he would compare it in a certain way with a sample of the cake he had been giving to his horses. The result of this comparison is given in the following extract from his reply :—" I have tried the ground-nut cake as you suggested and find it as you say. After emersion for twenty hours, the Bangalore cake is sticky and lumpy, is generally coarse, and has an unpleasant taste, while the Vellore cake which you sent me is much whiter in color, is without hard lumps in it, and is sweet to the taste." I would add to the foregoing that, in my experiments, in comparing a sample of Bangalore ground-nut cake with a sample of the same kind of cake procured from Vellore, the pieces of the former cake when put into water formed only a layer at the bottom of the glass, while the same quantity of the pieces of Vellore cake formed, after emersion for a similar time, a rich mucilaginous jelly, which rose up and entirely filled the glass.

116. From the many inquiries that have reached me regarding this valuable cake, I am led to believe that it is but little known to Europeans even in localities where it can be obtained in abundance at a low price ; the following remarks may, therefore be of use. The cake is the refuse obtained in the manufacture of ground-nut oil. The nuts are produced in the underground pods of the *corachis hypogœa*, a plant that is grown very largely in many parts of this Presidency as an ordinary field-crop. The Tamil name of the plant is Varcadalay, its Telugoo name is Varchenegaloo, and its Hindustani name is Velayethe Moongka pulli. The plant belongs to the natural order *Leguminosœ* ; its pods, as before noticed, bury themselves in the soil.

117. The oil of the ground-nut is highly valued in Europe ; indeed, it is generally quoted at a price from 10 to 15 per cent. higher than the best linseed oil ; it is said to be largely used as a substitute for olive oil, and that it is chiefly used for preserving sardines.

Draining.

118. *Subsoil Draining.*—In my last annual report I referred to an experiment in subsoil draining which had been begun but a short time before the close of the year. The field selected for the experiment measured nearly four acres ; it is divided in two nearly equal-sized parts by an open channel. One of these portions, which I shall refer to as plot (*a*), measures 8,800 square yards ; the other portion, plot (*b*), measures 8,742 square yards. The whole of the field has been drained in one way under what is known as the " gridiron " system. The ordinary drains are 3½ feet deep, and are placed 24 feet apart. Each plot is provided with one main drain which runs along at right angles to the line of the parallel drains, and into which the whole of the water is discharged ; the outlet of this drain is formed of brick built in lime with an iron grate over the vent to prevent rats, &c., going up the pipes. The depth of the main drain is four feet. Stone-drains have been laid down over the whole of plot (*a*), while plot (*b*) has been drained by means of pipe-drains.

The following statement shows the cost incurred in draining plot (*a*) :—

——	Cost.			Cost per acre.		
	RS.	A.	P.	RS.	A.	P.
Cost of cutting paralled drains, 988 running yards, at 3½ Rupees per 200 running yards	17	4	8	9	8	2
Cost of cutting main drains, 97 running yards, building an outlet, and providing a grate	6	14	7	3	12	10
Cost of broken stones, 341 parahs, at 4 pies per parah, 1,658 parahs, at 3½ pies per parah	35	2	8	19	5	6
Cart-hire for carting broken stones from quarry, 66 days, at As. 12	49	8	0	27	3	7
Cost of placing the broken stones in the drains, filling drains, &c.—25 men at 3 Annas per day and 45 women at 2 Annas per day ...	10	5	0	5	10	9
Total...	119	2	11	65	8	10

119. The cost per acre is very high, and is considerably in excess of the cost estimated in my last report. There are two reasons why this was so ; first, the coolies, not being able to use ordinary draining tools, it was found necessary to dig the drains very much wider than was originally intended in order to admit of them using their short-handled tools in the drains. This additional width caused no increase in the cost of cutting the drains, but it caused a very serious increase in the cost of the work by the necessity it created for the employment of a much larger quantity of broken stones than would have been required had the drains been cut only the usual width ; the other cause of the increased cost was the mismanagement of the carting, which, instead of being done under contract, was done by day-labor, and was not properly overlooked ; but, for these two causes, the cost of the work would not, I feel certain, have exceeded the estimate I gave : however in an experiment of such a very novel character it was not surprising that everything did not work as smoothly as might have been desired.

120. It was found impracticable to make drain-pipes on the farm in time to allow of the experiment being begun last year, and as drain-pipes could not be procured anywhere in the Presidency, I had no alternative but to use sewage-pipes, which are, of course, far too expensive, as for use in field draining these pipes are but little, if at all, superior to ordinary drain-pipes ; it would not be fair to debit the experiment with their cost; fortunately I have at hand figures of a reliable character from which the cost of manufacturing two-inch drain-pipes can easily be ascer-

tained. Since this experiment in draining was begun, we have had a considerable amount of experience on the Experimental Farms in the manufacture of two-inch drain-pipes, and this experience has afforded the following :—For an expenditure of Rupees 62 on labor and cattle-hire, 16,000 two-inch drain pipes were made and dried ready for burning, the average cost per thousand being Rupees 3-14-0 : this may be divided as follows :—

	RS.	A.	P.
Raising and mixing clay	0	6	0
Screening, &c.	0	10	0
Making pipes, rolling, &c.	2	2	0
Turning and drying pipes	0	4	0
Cart-hire	0	6	0
Other work...	0	2	0
Total...	3	14	0

As was to be expected our first attempts in burning the pipes were not attended with complete success. The kiln was but newly erected, the men were untrained, and the result was that a large quantity of the pipes was spoiled in burning. I cannot, therefore, from these results calculate the cost of the fuel used in burning the pipes. I prefer to take the cost from the results obtained during a considerable experience in pipe-burning at Home. In England with ordinary kilns it is found that 2¼ tons of coals are quite sufficient for burning 12,000 two-inch pipes; these at the Madras price, Rupees 24 per ton for coals sufficiently good for pipe-burning, would represent Rs. 4½ per thousand, but pipes do not need an intense heat; casuarina wood might be used either in part or exclusively as the fuel, in which case the cost of fuel for each thousand two-inch pipes would not exeeed Rupees 4 ; a further charge of Rupees 1¼ per thousand will pay the labor at the kiln and provide a fair allowance for interest on capital employed, wear and tear of sheds, machinery, &c., making a total charge, amounting to Rupees 9-2-0 per thousand, for well-burned two-inch pipes, which is the price charged in the following statement. The price of the pipes used in the main drains is obtained in the same way. With these exceptions, the items in the following statement are the actual charges incurred in draining plot (*b*) as follows :—

—	Cost.			Cost per Acre.		
	RS.	A.	P.	RS.	A.	P.
Cost of cutting parallel drains, 1,088 running yards, at Rupees 3-8-0 per 200 running yards	19	0	8	10	8	8
Cost of cutting 95 running yards of main drain, building outlet, and providing a grate	6	13	11	3	12	10
Value of 3,264 two-inch drain-pipes estimated at Rupees 9-2-0 per thousand	29	12	7	16	7	10
Value of 285 four-inch drain-pipes estimated at Rs. 12 per thousand.	3	6	9	1	14	4
Cart-hire for conveying pipes from kiln to field	3	0	0	1	10	7
Cost of laying pipes and filling earth into the drains—29 men at 3 Annas and 53 women at 2 Annas	12	1	0	6	10	10
Total...	74	2	11	41	1	1

121. With further experience it will, I think, be found possible to reduce the cost of draining an acre of land with pipes in the way described to Rupees 35, which sum charged over twenty-five years at the rate of $7\frac{1}{10}$ per cent. per annum, which would repay the whole of the capital with interest at 5 per cent., would represent an annual charge, amounting to Rupees 2-7-8 per acre, a very moderate price to pay for the benefits that will be gained. By increasing the depth of the drains and by placing them at wider intervals over the land, the cost of draining could be further reduced ; but, before this could be done, we must train our laborers to work with ordinary drain tools made, in size and weight, to suit their strength.

122. Of course, the fact that we have in this country to deal with conditions widely different to those met with in Europe must not be lost sight of; it is quite possible that the European system may prove unsuited to encounter the peculiar difficulties that may be met with in India. There is not room for a single doubt regarding the benefits the country will gain from its retentive soils being subsoil drained, but a difficulty may be experienced in devising a system of drainage specially suited to meet difficulties which may be encountered, such, for instance, as the closing of the pipes by white ants; the effects of a sudden fall of say 5 inches of rain in 24 hours, after an interval of say three months, in which not a drop of rain fell, &c.

123. Both of the plots were under maize and cotton last season; the crops were very good, seeing that, before being drained, the land was perfectly useless. Elsewhere will be found full particulars regarding these crops.

124. Plot (*a*) has not been successfully drained; the discharge of water after heavy rain was never very great, but lately it has been exceedingly small; there is evidently a stoppage somewhere. I fear that the openings in the soil which appeared in all parts of the field during the long drought, admitted the fine surface-dust amongst the stones during heavy rains; this dust forms on the surface of our arable soils during a drought, and from its extreme fineness it is easily conveyed away by water. Of course, when the water filters down through the soil, as it should do, this dust can never reach the drains; but the deep fissures I have before alluded to afford it a free passage. As long as the drains work properly, this would do but little injury; but immediately a stoppage occurs, it forms a dense mass with the broken stones that form the drain, and most effectually stop the passage of water. In Europe it has been found that thorough subsoil drainage at once puts an end to this periodical cracking of the soil, and it may prove to be so in this country when the drains have been longer in operation; but so far they have not proved effectual in this direction. By frequently cultivating and stirring the soil we can do a great deal to prevent the appearance of these fissures, but the system of drainage to be adopted in this country must be more perfect than to depend for success on the surface-soil being kept thoroughly tilled. Further experiments in draining with broken stones must be made before any conclusion can be formed. Though in the experiment I have made the cost of draining with stones is exceedingly high, it must not be forgotten that the whole of the expenditure incurred was for labor, and that while many ryots have not the means with which to purchase drain pipes, they can in most cases afford the labor needed for draining with stones.

125. The drainage of plot (*b*) has been most successful. The discharge of water is very great after heavy rains; during the monsoon, the flow for several days was as great as the pipe could discharge, and I have every reason to believe that up to the present time the action of the pipes continues quite perfect.

126. As far as can be judged from the short time these drainage experiments have been in operation, I consider that pipes will be far better suited than stones for use in draining, in this country. An important advantage attending the use of pipes is that land so drained can, during a drought, readily be subsoil irrigated by passing the irrigation water into them, sluices being put in the drains at suitable places to prevent the water passing out. By subsoil irrigation the water can be far more evenly distributed; no surface ground is required for water channels and there is less waste by evaporation. By thus combining drainage with irrigation, the agriculturist will be less dependent on the character of the seasons than at present.

Implements, Machines, &c.

127.—*The Double Mhote.*—Though the general results noticed in detail in my last report obtained in our experiments with this water-lift were most satisfactory, I thought that we might effect a still further improvement by substituting zinc buckets for the iron buckets with leather discharging tubes usually employed, and which so frequently needed repair; and the Overseer of the Experimental Farm having directed my attention to a model of a water-lift that he had con-

structed, in which zinc buckets were used on guide-rods that appeared to work in a satisfactory way, I determined to erect a double mhote at a well where a water-lift was needed, and to provide it with zinc buckets on the arrangements shown in the model, the fixed part of the machine was similar in construction to that of the double mhote noticed in my last report, excepting that only one horizontal beam resting on two pillars, with a short beam also resting on a pillar, were used instead of two long beams and four pillars, thus effecting a small saving in the cost of the machine. The buckets used were made of sheet zinc, strengthened by a light framework of iron ; on this framework, on either side, at about half the height, were placed iron rings which worked on the guides ; the bottoms of these buckets were perforated, and these holes were covered by a leather valve, which opened as the buckets began to descend into the water, and closed immediately they began to ascend ; the ropes were attached to handles made of rod iron, bent over on each side of the bucket and fixed on pivots, each bucket measured 2 feet 6 inches in height and 5 feet inches in circumference and brought to the surface on the average 36 gallons of water at each ascent. Each bucket worked on a pair of guide-rods made of round iron ; the lower ends of these rods were fixed in stones sunk in the bed of the well, their upper ends being fixed in the masonry of the discharging cistern, the rods were quite perpendicular from the bottom of the well up to the surface of the ground, when they gradually began to curve towards the cistern ; by this arrangement the buckets were made to empty their contents. At first it was found that the rods used were far too slight ; they vibrated so much during the ascent of the buckets, sometimes to such an extent as to arrest their progress, causing a severe strain on the working parts of the machine, this gradually became worse, until at length we had no choice but to remove the light rods and replace them by rods of a much greater diameter. When worked steadily, the machine gave most satisfactory results, raising in a day at least 50 per cent. more water than the first double mhote we erected, but the heavy rods though $\frac{3}{4}$ inch in diameter still vibrated very severely whenever the speed of the bullock was irregular. The machine was so severely strained whenever the buckets were checked in their ascent, frequent repairs became necessary, and as these were exceedingly troublesome in delaying work, and as I could see no way of rendering the rods more rigid, unless I incurred a considerable expense, I was obliged most reluctantly to abandon this arrangement for raising water, and to go back to the method described in my last report. If it had been possible to secure a steady working power, the arrangement would have answered admirably, but the slightest neglect on the part of the driver frequently caused an entire stoppage of the machinery. Had the water been nearer the surface of the ground, the vibrations in the rods would not, I think, have caused any inconvenience ; in the case noticed the water had to be raised 20 feet. If the rods could be stayed from the sides of the well they could be rendered quite rigid, but in this case the guide-rings could not be used, it would of course be possible, instead of the rings, to use a horse-shoe guide, which would not be arrested in passing up or down by the stays, but even with this it would be necessary to drive the cattle with great care or the guides would be thrown off the rods.

128. *Bullock-Gears.*—The bullock-gears in use for driving the water-elevators on the Experimental Farm have been considerably improved during the past year ; this improvement is in the method of attaching the cattle. Under the old arrangement, the two bullocks employed in working the elevator were separately yoked at opposite ends of a long pole, which was placed horizontally over the parapet wall across the centre of the well, and was supported and fixed in the middle to a head resting on the upright shaft of the driving wheel ; this pole projected about 4 feet on either side of the well, the ends being about 2 feet higher than the level of the bullock path, to these ends swingle-trees were attached, to which the bullocks were yoked by means of chains, connected with their collars. When engaged in raising water the cattle travelled around the well, and as there was always the well between them, it was exceedingly difficult to keep them going at a regular pace, when only one driver was employed ; when the driver was behind one bullock, the one on the other side took its ease, and when it received the attention of the driver the other in its turn slackened its pace, thus an irregular jerky motion was produced in the water-lift,

causing much injury to the working parts, and lessening the amount of work performed. A seat was placed for the driver over the centre of the well on the horizontal pole which rotated as the animals travelled around, but this seat was much disliked by the driver, and I think not without good reason, while when so seated he was not more successful than when on foot ; the fact is the cattle of this country are trained to work with their driver behind them, and it is exceedingly difficult to get them to work in any other way. Under these circumstances I determined to try what could be done to admit of the driver being always near both bullocks, as it would have been much too costly to employ two men. The head for the straight shaft was removed and in its place a V-shaped head was used, its narrow end was turned inwards and rested on the upright spindle of the driving wheel, in each of the arms of the head an horizontal shaft was fixed, these projected over the bullock path, the distance between these shafts at their outer ends was about seven feet ; upright bullock yokes were attached to these shafts, under which the cattle walked, the height of the bullock path having been cut down sufficiently low to admit of this being done, a syphon placed under the path serving to keep up the height of the water discharged by the lift. By this arrangement one bullock walks close behind the other, both being under the control of the driver, thus a larger amount of work is performed and the machinery is worked steadily.

129. *Straw-Burning Engines.*—The improvements recently made in steam engines, whereby they are enabled to burn such fuel as straw, indigo stalks, the stems and branches of cotton plants, &c., will admit of steam being used as a motive power in this Presidency to a much larger extent than seemed possible only a couple of years ago. The districts in which only steam culture seemed pracaticble were almost quite without fuel suited for raising steam in Portable Engines, but, in these districts, after the cotton harvest, there is in the cotton plants a plentiful supply of fuel suited for the requirements of Straw-Burning Engines. Straw cannot be used alone for raising steam in ordinary engines, its combustion is so irregular. We cannot, in Southern India, afford to burn any straw that is fitted for the use of live stock ; but there is in most parts of the Presidency a plentiful supply of materials, the refuse of the crops, suitable for use in these engines, that possess no value as food for stock.

SYDAPET MODEL FARM.

130. *The Sydapet Model Farm.*—Before reviewing the results obtained from the working of this farm during the past year, I would, in order that the the nature and present condition of the experiment may be fairly understood, direct attention to the following extracts from my report for the year ending 31st of March 1871, showing the circumstances under which the farm was started:—

" 238. The northern portion of the estate which, since the Committee (since abolished) took charge of the property, has always been rented by small tenants, was, in the early part of July last, set apart for the purposes of a Model Farm."

" 239. The condition of the land was very unsatisfactory ; the greater portion was overgrown with weeds and bushes, and a very considerable area had been appropriated by the public. Not only was the appearance of the land very discreditable ; but, owing to the great amount of trespass it caused, it was a nuisance to the neighbouring Experimental Farm."

" 240. At no time had the rents been regularly paid ; but it had become very difficult to collect even a very small proportion. It was in vain that large remissions had been made ; the renters were men of very small means, and several were without any agricultural training."

" 241. Most of them held under a five-years' lease, two years of which were unexpired. During the early part of last year several of them petitioned to be allowed to relinquish their land : but it was not until the month of July, when a general petition was received from all the tenants, that, seeing no other chance of bettering matters, it was determined to write off all arrears, and to take the land into our own management.

"253. Attempts have evidently been made, at different times, to bring portions under cultivation ; many of these attempts had been made in injudiciously-selected places, the result

was a broken surface on which it was scarcely possible to find a block of five acres fit for immediate cultivation........................ "

"242. The total area thus set apart for a Model Farm is 115 acres; of this area seven acres is occupied by the nullah, roads, buildings, &c........................"

"243. Nearly thirty acres can be irrigated, twenty acres from the Mambalam tank by gravitation and the remainder from the wells by picottahs, &c........................"

"244. The dry soils differ greatly; about thirty acres is a blowing sand of the lowest type, about forty acres is a sandy loam of fair quality, free and easy to work, but in a very impoverished state; the remainder is a stiffish loam with a good deal of clay in its composition and a considerable amount of the red oxide of iron."

"245. To put the undertaking on a thoroughly commercial footing, it was determined to fix the rent at the average yearly income of the previous four years, and to deduct the annual value of the fruit trees which had to be removed to facilitate the work of reclamation."

"246. The average income of these four years was found to be Rupees 535."

"9. It was necessary, in order that the land should be thoroughly reclaimed and put into a good cultivatable condition, that a large number of indifferent mango and guava trees should be cut down. These were chiefly old trees which would not continue to bear much longer, though for a season or two they would be worth 150 Rupees per annum. Deducting this sum from the average annual income from the land, there remains a balance of 385 Rupees, and this sum will be the yearly rent to be recovered from the Model Farm. The timber and jungle clearings realized 2,721 Rupees; this was carried to the credit of the estate........................"

131. It will be gathered from these extracts that the rent of the land selected for this Farm was fixed without any regard to the condition of the land or the quality of the soils. The fact that it had been abandoned by the persons who had previously rented it did not receive sufficient attention at the time the rent was fixed. It seemed perfectly fair to adopt as the rent to be paid by the Farm the average annual income derived from the land during the previous four years, but a sufficient allowance should have been made to compensate for the broken surface of the land, and for the worn-out and exhausted state of the soils.

132. Up to the present time the sum expended in bringing this land into cultivation is about Rupees 2,300, and it is probable that before the whole of the land is brought into a good cultivatable condition the entire expenditure will reach something near 5,000 Rupees. From its commencement, besides paying a full rent, the Farm has been debited with a charge at the rate of 7½ per cent. on every Rupee expended on works of reclamation and improvement, the sums paid on this account being as follows:—

	RS.	A.	P.
1870-71	94	6	7
1871-72	296	1	8
1872-73	328	1	6
1873-74	328	1	6
Total...	1,046	11	3

But this also includes interest on the capital expended in erecting buildings, which amounts to about Rupees 2,000; this, at 7½ per cent. for 3½ years, represents Rupees 525, which sum taken from Rupees 1,046-11-3 leaves Rupees 521-11-3 as the sum paid in the shape of interest on the money expended in reclaiming the land from its dilapidated condition &c. It seems to me now, scarcely fair to have called upon the Farm to pay this amount in addition to the full rent, for the rent charged *but just represents the value of the land after reclamation.* In proof of this I quote below an extract from the Classification Register of the southern portion of the estate, which land was taken up to form the Experimental Farm, and which, at the time it was classified and valued, was almost as well suited for being immediately brought under regular cultivation as

is the Model Farm land, after so much money has been expended in reducing its surface to a state fit for being brought under regular cultivation.

Classification Register of that part of the Model Farm (Experimental Farm) that as been already laid out in fields.

No.	Irrigated or dry.	Source of irrigation.	Description of soil.		Taram.	Rate per acre.		Area.		Assessment	
						RS.	A.	ACRES.	CENTS.	RS.	A.
1*a*.	Dry	Government well.	Permanently improved...2	1	1	4	8	0	25	1	2
...*b*.	Do.	......	Black sand...5	1	5	1	8	4	21	6	5
2	Do.	......	Do. ...5	2	6	1	4	15	51	19	6
3	Do.	......	Red loam ...7	2	5	1	8	6	66	10	0
4	Do.	......	Do. ...7	2	5	1	8	1	94	2	15
5	Peramboke...	......	......		...	......		0	67	......	
6	Dry	Government well.	Permanently improved...2	1	1	4	8	0	68	3	1
7	Do.	......	Black loam...4	2	4	2	0	0	75	1	8
8	Do.	Government well.	Red loam ...7	1	4	2	0	8	63	17	4
9	Do.	......	Do. ...7	1	4	2	0	5	21	10	7
10	Peramboke...	......	......		...	......		5	18	......	
11	Dry	Government well.	Permanently improved...2	1	1	4	8	3	90	17	9
12	Do.	......	Red loam ...7	1	4	2	0	4	11	8	4
13	Do.	......	Do. ...7	1	4	2	0	3	93	7	14
14	Do.	......	Black sand...5	2	6	1	4	3	99	5	0
15	Do.	......	Do. ...5	2	6	1	4	11	96	14	15
16	Do.	......	Black loam...4	2	4	2	0	5	59	11	3
17	Do.	......	Do. ...4	2	4	2	0	4	43	8	14
18	Do.	......	Black sand...5	2	6	1	4	7	19	9	0
19	Do.	......	Do. ...5	2	6	1	4	12	14	15	3
20	Do.	......	Red sand ...8	2	6	1	4	2	61	3	4
21	Do.	......	Do. ...8	2	6	1	4	1	47	1	13
22	Do.	......	Do. ...8	2	6	1	4	3	34	4	3
23	Do.	Government well.	Do. ...8	2	6	1	4	5	1	6	4
24	Do.	......	Do. ...8	2	6	......		3	79	4	12
25	Peramboke...	......	......		...	......		9	42	......	
						Total...		132	57	190	2

Abstract exhibiting the area and assessment of each class of soil

Taram or class.	Rate per acre.		Area.		Assessment.	
	RS.	AS.	ACRES.	CENTS.	RS.	AS.
1	4	8	4	83	21	12
4	2	0	32	65	65	6
5	1	8	12	81	19	4
6	1	4	67	1	83	12
	Total...		117	30	190	2
	Peramboke...		15	27	......	
	Grand total...		132	57	......	

(Signed) R. K. PUCKLE,
Deputy Director, Revenue Settlement.

(133.) After the completion of the improvements now in progress, the soils of this Farm may be roughly classified and valued as below:—

		Annual rent. RS.	A.	P.
20	Acres under tank* irrigation at Rupees 10 per acre ...	200	0	0
10	Acres under well irrigation at ,, 5 per acre ...	50	0	0
40	Acres of dry land at ,, 2 per acre ...	80	0	0
30	Acres of dry land at ,, 1¼ per acre ...	37	8	0
8	Acres of dry land at ,, 3 per acre ...	24	0	0
7	Acres under roads, &c.	...	...	..
111		391	8	0

134. But before the land is brought into this condition, the total expenditure incurred, as before noticed, will not be less than Rupees 5,000, which sum, at 7½ per cent., will represent an annual charge of Rupees 375 in addition to the rent, making the gross rental Rupees 760, or about *twice the amount at which the rent would have been fixed by the Settlement Department*; and in addition to this the farm pays 7½ per cent. on capital invested in buildings, and 5 per cent. on its working capital; the last two items are fair, but I certainly think that the farm *should be relieved of all charges on behalf of expenditure in levelling the land, &c.*, as these improvements directly add to the value of the property, and should not in justice be made at the expense of the occupying tenant.

135. On first starting the Model Farm, being so anxious that it should be debited with every charge that could in reason be placed against it, I unfortunately went too far in this direction, and burdened the farm with charges which, I am now convinced, should not have been debited against it. Thus, while the farm has been struggling with difficulties and showing an unsatisfactory balance sheet from having to meet these charges, the value of the property has been gradually increasing. In short, the tenant has been sacrificed for the good of the landlord. For if the estate was put into the market to-morrow, it would bring at the least Rs. 5,000 in excess of the price paid for it, and when the farm was begun timber and clearings to the value of Rupees 2,700 were sold, and the proceeds paid over to the landlord.

136. At the close of the year under review there was a debit against the farm amounting to Rupees 1,674-0-9, that is, after paying the full rent interest at 7½ per cent. on capital sunk in permanent improvements, interest at 5 per cent. on working capital, and every other charge since the farm was begun; the result of last year's operations is as follows:—

	RS.	A.	P.
The expenditure—			
Rent and interest	913	1	6
Overseer's salary	610	0	0
Labor	1,317	1	11
Cattle	105	0	0
Pigs	67	0	0
Sheep	35	8	3
Poultry, rabbits, &c.	45	2	0
Implements, machines, and tools...	67	5	0
Seeds	122	13	5
Cattle food	531	15	1
Manure	41	7	7
Sundries	16	10	2
	3,873	0	11
Income—			
Advance from General Funds	1,522	13	8
Cattle	419	7	5
Sheep	188	10	9
Pigs	390	11	6
Poultry, rabbits, &c.	65	2	10
Fruits, plantain, and vegetables	290	1	11
Fodder, &c.	238	11	3
Grains	411	5	7
Indigo and cotton	232	12	6
Sundries	113	3	6
	3,873	0	11

* During 5 months only in the year.

The balance sheet on the 31st March 1874.

LIABILITIES.

	RS.	A.	P.
Loan from General Funds for 1870-71	2,776	9	10
Do. do. for 1871-72	1,310	3	11
Do. do. for 1872-73	1,772	2	2
Do. do. for 1873-74	1,522	13	8
Laborers' pay due for March 1874	155	5	3
Total Liabilities...	7,537	2	10

ASSETS.

	RS.	A.	P.	RS.	A.	P.
Cattle.						
16 Working cattle	1,200	0	0			
5 Feeding cattle	75	0	0			
Sheep.						
26 Ewes, 4 Wethers, 23 Lambs	260	0	0			
Pigs.						
5 Boars, 7 Sows, 4 Geldings	450	0	0			
Poultry	75	0	0			
				2,060	0	0
Implements.						
Implements, tools, carts, &c., as catalogued				760	1	6
Manures.						
200 Cart-loads of alluvial earth	30	0	0			
130 Do. of fold-yard manure	97	0	0			
43 Cart-loads of sulphate of lime and ashes ...	10	0	0			
¼ Cost of manure purchased in 1872-73... ...	30	3	7			
¼ Cost of cake purchased in 1872-73	126	8	11			
½ Cost of manure purchased in 1873-74... ...	20	11	9			
½ Cost of cake purchased in 1873-74... ...	265	15	6			
4,500 Pounds of straw	20	0	0			
				600	7	9
Fruit Trees, &c.						
Cocoanut and Mango trees, Casuarina trees, Guava trees	762	0	0			
Fruit Crops.						
Gauva, &c.	350	0	0			
				1,112	0	0
Field Crops.						
Grain and pulse crops...	80	0	0			
Guinea grass	150	0	0			
Fodder crops of sorts	250	0	0			
				480	0	0
Cattle Food.						
338 Pounds of oil cake	5	0	0			
15,000 Pounds of cholum straw	70	0	0			
Seeds, &c., in Granary.						
1,242 Pounds of car paddy	20	11	2			
874 Do. of sumba paddy	17	7	8			
25 Do. of indigo seed	2	0	0			
20 Do. of yellow cholum	0	8	0			
Sundries	199	8	0			
Cultivation done for next season's crop ...	100	0	0			
Uncollected bills	435	6	0			
				850	8	10
Deficiency				1,674	0	9
				7,537	2	10

137. The return obtained from most of the best land was greatly lessened by the bad physical condition of the soil, produced by the flooding of the river Adyar; not only were several successive sowings destroyed, but the land from the absence of drainage became water-logged and yielded little more than half a crop. I am convinced that, unless this land, subject to being flooded, is thoroughly subsoil drained, it will never return a reasonable profit under high cultivation.

138. Under low farming, when little is spent on manure, &c., &c., there is but little to lose when adverse circumstances are encountered. High farming demands a large expenditure on labor, manure, &c., and the loss is proportionately great when unpropitious conditions are met with; hence before high farming can be successfully practiced, the conditions with which it has to deal must be somewhat under control, and therefore irrigation and drainage are essential to success where floods and droughts occur periodically.

139. Unfortunately the Model Farm is but ill-provided with irrigation water, and it is altogether without drainage of any kind. During the cropping season, between September and the end of November, all the low-lying land is frequently submerged by the overflow of the river which frequently results in the entire destruction of the paddy under which this ground is cropped, rendering it necessary to replant as late as December, which crops are not matured until April, by which time the irrigation water from the Tank has ceased to flow; if we can subsoil drain these low-lying lands, the ill-effects of the floods would be much less serious, as the drains would soon carry off the excess of water, and we would be able to harvest our crops in December, and thus not only be able to secure good crops, but we would have the further advantage of taking a second crop off the land before the irrigation source failed for the season.

140. The following statement shows the income and expenditure of the farm from its commencement:—

Income up to and including 31st of March 1874.

Items.	*1870-71.			1871-72.			1872-73.			1873-74.			Total.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Cattle...	403	1	9	560	14	9	371	15	0	419	7	5	1,755	6	11
Sheep...	...	...	...	141	10	6	237	2	6	188	10	9	567	7	9
Pigs	...	...	...	263	14	0	664	5	9	390	11	6	1,318	15	3
Poultry, rabbits, &c....	12	6	0	97	8	0	203	4	0	65	2	10	378	4	10
Fruits, plantains, and vegetables, &c. ...	474	12	6	582	10	3	444	1	6	290	1	11	1,791	10	2
Hay, green fodder, &c.	42	8	0	256	6	0	484	13	6	238	11	3	1,022	6	9
Grains.	407	0	10	705	9	3	178	11	2	411	5	7	1,702	10	10
Indigo and cotton ...	...	...	...	...	...	...	...	...	...	232	12	6	232	12	6
Sundries	101	10	3	228	4	0	301	9	10	113	3	6	744	11	7
Total...	1,441	7	4	2,836	12	9	2,885	15	3	2,350	3	3	9,514	6	7
Add the net valuation of the assets on the 31st of March 1874													5,707	12	10
Total...													15,222	3	5

* Half year.

Expenditure up to and including 31st of March 1874.

Items.	*1870-71.			1871-72.			1872-73.			1873-74.			——			Total.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Cooly labor....................	1,105	4	2	1,375	9	11	1,369	14	0	1,317	1	11	5,167	14	0			
Manure	3	0	0	71	1	4	185	2	7	41	7	7	300	11	6			
Live stock....................	1,641	15	0	731	6	8	636	3	0	252	10	3	3,262	2	11			
Food for live stock	267	11	9	557	7	3	506	3	11	531	15	1	1,863	6	0			
Seeds, trees, &c.	194	1	7	91	6	7	153	9	2	122	13	5	561	14	9			
Implements, tools, &c.......	461	9	0	18	13	0	277	8	6	67	5	0	825	3	6			
Contingencies................	74	4	9	100	2	3	16	6	9	16	10	2	207	7	11	12,188	12	7
Overseer's salary......	113	12	0	370	0	0	600	0	0	610	0	0	1,693	12	0			
Rent................................	192	8	0	385	0	0	385	0	0	385	0	0	1,347	8	0			
Interest on capital employed in working the Farm.	69	8	4	150	0	0	200	0	0	200	0	0	619	8	4			
Interest on capital expended on improvements of a permanent character......	94	6	7	296	1	8	328	1	6	328	1	6	1,046	11	3	4,707	7	7
Total...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16,896	4	2

141. It will be noticed, from what I have said, that the information to be derived from this experiment is *the cost of reclaiming and restoring land that has been exhausted under native farming*, rather than *the commercial results that can be secured by adopting a better system of agriculture*; to open a farm on virgin land and bring it into cultivation, is widely differen t.

IMPLEMENT WORKSHOPS.

142. During the past year Rupees 2,363-1-8 were received for implements, machines, &c., sold, and for labor and materials supplied by these workshops; and the expenditure on their behalf was Rupees 2,149-7-3.

143. The balance against these workshops from their commencement up to the 31st of March 1874 is Rupees 540-0-4, which sum includes interest on capital and every other charge. There should be no deficiency, as the prices charged are fixed to cover the cost of materials, coals, labor, interest on the capital employed, &c.; but during the past year the prices of iron and coals have fluctuated so greatly it has been difficult to adjust our charges to provide for these fluctuations, and it is exceedingly difficult in a small undertaking such as this is to keep accurate accounts, especially when much repairing work has to be executed; we cannot yet afford to employ a foreman in these workshops who would be able to keep accounts, and we have therefore to make up our charges for work, &c., from the rough memorandum kept by the workmen themselves. The Overseer of the Experimental Farm has charge of the workshops, but he can give them but very little personal attention, as his duties on the farm afford him full employment. A large amount of repairs are done for both farms, and it is very probable that all these charges have not been credited in the workshop account, especially for the work performed during the three months that Overseer Young was engaged in connection with the Agricultural Exhibition.

144. The debit against these workshops at the close of the year is but an insignificant sum, in comparison with the sum that would represent the advantages the Sydapet Farms enjoy from these workshops.

145. The recent appointment of an Assistant to aid me will enable me to put the accounts on a better footing, and make the workshops generally more efficient.

146. These workshops supplied during the year three improved carts, nine iron and combined ploughs, one iron cultivator, two sets of iron harrows, forty-two improved grass knives, several working models of ploughs, water-lifts, &c., a number of tools, and did a large amount of work for the Sydapet Farms.

* Half year.

147. The following are the details of income and expenditure during the past year :—

Income.

	RS.	A.	P.
Machines	834	10	9
Materials, labor&c., ...	1,528	6	11
	2,363	1	8

Expenditure.

Plant	4	5	0
Cooly labor, &c.	1,158	2	10
Materials, &c....	986	15	5
	2,149	7	3

Implement Workshops balance sheet for the year ending 31st of March 1874.

Liabilities.

	RS.	A.	P.
Advance from General Funds for 1870-71	883	1	5
Do. do. for 1871-72	213	1	2
Do. do. for 1872-73	1,077	3	2
Laborers' pay due for March 1874	88	13	3
Outstanding bills	95	0	0
	2,357	3	0
Deduct capital returned by sale of machines, &c., during 1873-74.	213	10	5
	2,143	8	7

Assets.

Buildings...	419	15	3
Plant	314	5	6
Materials...	197	7	1
New implements, machines, &c., in stock	412	4	0
Outstanding bills	259	8	5
*Deficiency	540	0	4
	2,143	8	7

148. *Establishment.*—The work of this Department having far outgrown the capabilities of any one person, two Assistant Superintendents have been appointed ; one is a German and the other is an Englishman ; the former, Mr. Kaspar Schiffmayer, received his agricultural training in the Bavarian High School of Agriculture and at the University of Munich ; the latter, Mr. Charles Benson, is a graduate of the Royal Agricultural College, England. Both of these gentlemen have arrived in Madras and have entered upon their duties ; however, they must have a few months experience in this country before their services can be fully utilized. The general conduct of the Overseers and Clerks was satisfactory ; the Apprentices with one or two exceptions conducted themselves in a satisfactory manner.

SYDAPET, (Signed) WILLIAM R. ROBERTSON, M.R.A.C.,
31st *March* 1875. *Superintendent of Government Farms.*

* Since the commencement of the Workshops.

APPENDICES.

Rain-fall registered at the Experimental Farm during the year ending 31st March 1874.

Day	April 1873. Inches.	May 1873. Inches.	June 1873. Inches.	July 1873. Inches.	August 1873. Inches.	September 1873. Inches.	October 1873. Inches.	November 1873. Inches.	December 1873. Inches.	January 1874. Inches.	February 1874. Inches.	March 1874. Inches.
1	...	...	...	0·14	...	0·95	...	...	6·15	...	...	...
2	...	...	...	0·35	0·07	...	0·05	...	2·31	...	...	...
3	0·53	...	0·12	0·07	...	0·23	1·10	...	1·86	...	...	...
4	1·67	...	...	...	0·46	...	1·28	...	0·08	...	...	...
5	...	...	...	...	...	...	0·81	...	...	...	...	...
6	...	...	...	...	...	...	0·80	...	...	...	...	...
7	...	...	...	...	...	...	0·06	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...
9	...	...	0·36	...	...	...	1·40	...	...	...	...	...
10	0·18	...	...	...	...	...	0·68	...	...	...	...	...
11	...	...	...	...	...	...	0·03	...	...	...	...	...
12	...	...	0·20	...	...	...	1·03	0·52	...	...	...	...
13	...	...	...	...	...	...	1·02	0·20	...	...	...	...
14	...	...	...	0·04	...	...	0·56	0·93	...	...	...	...
15	...	...	...	...	...	...	0·60	0·08	...	...	...	...
16	...	...	0·46	0·10	...	...	...	...	...	...	...	...
17	...	...	...	0·05	...	...	...	0·51	...	...	...	...
18	...	...	...	...	...	1·25	0·22	...	0·50	...	...	...
19	...	...	...	...	0·19	...	...	...	...	...	...	...
20	...	...	0·17	...	...	0·35	0·17	...	...	...	...	...
21	...	...	...	...	...	...	...	0·85	...	...	...	...
22	...	...	...	...	0·55	0·90	...	1·60	...	...	...	...
23	...	...	...	0·46	0·30	3·34	1·14	0·35	...	...	...	...
24	...	...	...	0·14	...	...	...	...	...	...	...	...
25	...	...	0·37	...	1·42	...	...	0·77	...	...	...	...
26	...	...	...	0·15	...	...	...	0·67	...	...	...	...
27	...	...	...	...	...	0·22	0·27	0·59	...	...	...	...
28	...	...	...	...	...	...	...	0·59	...	...	...	...
29	...	...	...	...	0·17	...	...	0·90	...	...		...
30	...	...	...	...	...	...	1·08	0·35	...	...		...
31		...		...	...		...		...	...		...
Total	Total ... 2·38	Total. None.	Total... 1·68	Total ... 1·50	Total ... 3·16	Total ... 7·24	Total... 12·30	Total ... 8·91	Total... 10·90	Total... None.	Total... None.	Total. None.

Government Farms' Expenditure.

	RS. A. P.	RS. A. P.
I. *General Supervision.*		
Establishment, including Superintendent's horse allowance ...	9,981 11 9	
Travelling allowance ...	... ...	
Contingencies ...	313 12 6	
		10,295 8 3
II. *Madras Experimental Farm.*		
Establishment ...	918 13 9	
Labor ...	3,008 10 6	
Implements and machines ...	882 12 8	
Live stock ...	297 2 6	
Seeds ...	195 9 6	
Food for live stock ...	1,519 1 0	
Manure ...	542 15 7	
Despatching seeds...	135 5 8	
Contingencies ...	229 7 5	
		7,729 14 7
III. *Madras Model Farm.*		
Establishment ...	610 0 0	
Cooly labor ...	1,317 1 11	
Manure ...	41 7 7	
Live stock ...	252 10 3	
Food for live stock ...	531 15 1	
Seeds ...	122 13 5	
Implements, carts, and water-lifts ...	67 5 0	
Rents and interest ...	913 1 6	
Contingencies ...	16 10 2	
		3,873 0 11
IV. *Implement Workshops.*		
Blacksmiths, carpenters, and filer ...	875 9 1	
Cooly labor ...	282 9 9	
Implements, machines, and materials ...	991 4 5	
		2,149 7 3
V. *Educational.*		
District Farm Apprentices...	2,166 3 6	
Sydapet do. do. ...	1,330 6 9	
Schoolmaster for laborers' children ...	80 1 6	
Books for library ...	114 0 2	
House-rent, &c., to Assistant Superintendent ...	483 8 9	
Contingencies ...	225 5 5	
		4,399 10 1
VI. *Estate Improvements of a Permanent Character.*		
Repairs to buildings, water channels, &c. ...	1,712 3 0	
Repairs to roads ...	484 15 6	
Additions to out-houses of Farm bungalow ...	459 11 5	
Repairing and deepening wells ...	298 4 1	
Gate-houses and gates ...	1,023 10 8	
New roads ...	1,501 9 0	
Water channels ...	94 14 0	
Sub-soil and surface drainage ...	553 11 8	
Trees and planting ...	34 3 8	
Contingencies ...	14 12 0	
		6,177 15 6
Agricultural Exhibition net expenditure ...	... ...	8,890 3 1
	Total ...	43,515 11 2

Government Farms' Receipts.

	RS. A. P.	RS. A. P.
I. *Madras Experimental Farm.*		
Fruits, vegetables, &c.	134 10 6	
Fodder, &c.	114 12 9	
Rent, &c.	1,166 9 0	
Cattle	105 0 0	
Sheep	78 11 2	
Pigs	128 14 6	
Poultry, rabbits, &c.	35 9 0	
Feeding-grains, seeds, and cattle-food	370 9 10	
Cotton, &c.	249 2 0	
Sundries	528 14 11	
		2,912 13 8
II. *Madras Model Farm.*		
Fruits, vegetables, &c.	290 1 11	
Fodder, &c.	238 11 3	
Cattle	419 7 5	
Sheep	188 10 9	
Pigs	390 11 6	
Poultry, rabbits, &c.	65 2 10	
Feeding-grains, seeds, and cattle-food	411 5 7	
Indigo	144 4 0	
Cotton	88 8 6	
Sundries	113 3 6	
		2,350 3 3
III. *Implement Workshops.*		
Machines, &c.	834 10 9	
Labor, materials, &c.	1,528 6 11	
		2,363 1 8
	Total ...	7,626 2 7

Valuation of the Live and Dead Stock of the Experimental Farm on the 31st of March 1874.

	RS. A. P.	RS. A. P.
Cattle—		
3 Bulls ... ... 21 Working cattle	1,315 0 0	
Sheep—		
38 Rams ... ... 60 Ewes ... ... 23 Gimmers ... ... 44 Lambs	934 0 0	
Pigs—		
3 Boars ... ... 20 Sows ... ... 20 Young pigs	705 0 0	
Poultry	70 0 0	
		3,024 0 0
Manures.		
Guano, bones, and charcoal ... ... Fold-yard and other manures	... ...	385 0 0
Growing Crops.		
Fodder (of sorts)...	187 0 0	
Plantains, &c.	400 0 0	
Guinea grass	175 0 0	
Cotton	100 0 0	
Indigo	60 0 0	
Cocoanut and cashewnut trees	150 0 0	
		1,072 0 0

[*Farm Seeds, &c.*

		RS. A. P.	RS. A. P.
595	lbs. of Pegu paddy	19 13 4	
475	,, of Goondoo Sumba paddy	9 8 0	
258	,, of Carolina paddy	8 9 7	
245	,, of Sumba paddy	4 14 5	
22½	,, of Red Pootoo paddy	1 0 0	
21	,, of Burmese paddy	1 0 0	
76½	,, of White Pootoo paddy	3 13 2	
65	,, of Car paddy	1 1 4	
616	,, of Yellow Cholum	15 6 5	
147	,, of Shamay	5 14 4	
62½	,, of Horse-gram	1 9 0	
9	,, of Linseed	1 2 0	
30	,, of Gingelly	1 12 10	
47	,, of Green Gram	2 2 2	
143½	,, of Sorghum Saccharatum	7 2 9	
66	,, of Caromony	3 0 0	
233	,, of Corkapilly seed	11 10 5	
140	,, of Caster-oil seed	4 6 5	
153	,, of Cotton in seed	13 8 0	
30	,, of White Oats	2 0 0	
283	,, of clean Cotton	65 14 8	
6,180	Maize Cobs	62 0 0	
234½	lbs. of Wool	21 15 9	
			269 4 7
	Cattle Food.		
3,519	lbs. of Ground-nut oil cake	... ...	47 8 1
	Implements.		
	Implements and tools as catalogued in Inventory*	... ...	5,027 5 0
		Total ...	9,825 1 8

Catalogue of Machines, Implements, Tools, &c., belonging to the Experimental Farm on the 1*st of April* 1874.

1 Set of steam ploughing and cultivating apparatus, tackle, windlass, porters, &c. by Messrs. Fowler and Co.

1 Chaff-cutter and universal mill, with bullock-power by Messrs. Ransomes and Sims.

1 Threshing machine, with a bullock-power, by Emery Brothers.

1 Threshing machine by Dray Taylor and Co.

1 Threshing machine, with bullock gear and carriage, by Ransomes and Sims.

1 Threshing machine, with a bullock gear and carriage, by Garret and Co.

2 Winnowing machines by Garret and Co.

1 Winnowing machine by Dray Taylor and Co.

1 Winnowing machine by Ransomes and Sims.

1 Winnowing machine by Hornsby and Sons.

3 Reaping machines by Samuelson and Co.

1 Drill sowing machine, 8 rows, by Garret and Co.

1 Cylindrical corn screw by Ransomes and Sims.

2 Ploughs by Ames and Co., Boston.

1 Turn-wrest plough and yoke by Ransomes and Sims.

1 Stone roller.

2 Drill sowing machines, 13 rows, by Garret and Co.

1 Wood drag-harrow by Experimental Farm.

2 Iron chain harrows.

1 Combined grubber.

4 Bullock hoes.

1 Bullock plough by Howard and Co.

1 Bullock plough by School of Arts.

2 Bullock ploughs by Mint.

2 Bullock ploughs by Ransomes and Sims.

1 Double mould board plough.

1 Large plough, with two wheels, by Ransomes and Sims.

1 Swing plough by Roorkee Workshop.

1 Wood swing-plough by Ransomes and Sims.

1 Wet land plough by Experimental Farm.

1 Wooden roller.

1 4-wheel waggon.

1 Stone trolley.

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* Steam Engine transferred from Agricultural to Public Works Department.

1 Root-pulper by Ransomes and Sims.
2 Sets of iron harrows, with swingletree, by Ransomes and Sims.
3 Country carts.
1 Water cart.
1 Sewage cart, by Gun Carriage Works.
1 Maize sheller, by Ainsworth and Co.
1 Maize sheller, by Ransomes and Sims.
1 Drainpipe-making machine.
1 Corn drill.
1 Barrow drill, by Experimental Farm.
1 Rain gauge.
1 Water elevator, by Burges and Key.
1 Water elevator, by Mint.
1 Water elevator, by Experimental Farm.
1 English ladder.
1 Norton's tube-well with a rotary motion.
1 English grindstone.
1 Farm bell.
2 Wheel hand-hoes.
9 Cattle yokes.
2 Single bullock carts.
1 Overhead, bullock-power, with shafts and gearing.
1 Sugar-cane mill.
1 Californian pump.
1 Archimedian pump.
1 Cake-crusher.
1 2-wheel plough with cultivator, by Ransomes and Sims.
1 Pump, by Roorkee Workshop.
1 Chaff-cutter, manual-power.
1 Combined mill and oil-cake breaker, by Ransomes and Sims.
1 Chain pump, manual-power.
1 Chain pump, bullock-power.
1 Large platform weighing machine.
1 Large beam and scales.
1 Cotton gin, by Gordon and Co.
1 Cotton gin, by Donlop.
1 Cotton gin, by Platt Brothers.
1 Country cotton gin.
8 Cottage cotton gins.
2 Cotton gins, by Burges and Key.
1 Hand broad-cast sowing machine.
5 English carts.
1 Malabar spoon bale.
1 Waterproof cart cover.
1 Sack-barrow.
1 Portable scale with weights.
3 Picottah buckets.
2 Leather buckets with ropes and gearing for double mhote.
1 Large wheel-barrow.
14 Wheel-barrows.
3 Hay frames for carts.
1 Hand cart.
1 Subsoil plough.
2 Farm clocks.
5 Tables.
8 Chairs.
1 Writing desk.
5 Almirahs.
1 Iron cash chest.
2 Writing tables.
2 Book-shelves.
1 Dynamometer.
1 Surveying level with stand, staves, &c.
1 Set of bottle levels. Chemical Apparatus, Mortars and Pestles, Glass-breakers, &c.
29 Feeding tubs.
5 Metal feeding troughs.
1 Scythe.
1 Manure drag.
2 Bengal picks.
2 Dutch hoes.
10 Hoes.
10 Hand-hoes.
5 Forks of sorts.
2 Hand harrows.
7 Iron rakes.
32 Mamoties.
2 Hatchets.
1 Large field rake.
13 Crowbars.
16 Picks.
2 Mattocks.
2 Hedge shears.
3 Billhooks.
1 Iron real.
7 Grass knives.
4 Manure forks.
14 Digging forks.
1 Horse hoe.
6 Shovels.
4 Sets of bullock harness.
2 Surveying chains with pins.
2 Iron cisterns.
A quantity of wire rope, and a large number of details belonging to steam plough.
35 Specimen seed bottles.
2 Hedge knives.
3 Pairs of thorn pincers.
1 Spade.
1 Ear punch for marking sheep.
1 Mercal, one half-mercal, and one measure.
1 Weeding spud.
3 Pairs of sheep shears.
1 Pruning knife.
1 Dibble.
A number of spanners.
4 Mallets.
4 Rammers.
1 Poultry feeding-cage.
1 Maize cobstand.
2 Driving wheels.

1 Large rubbish screen.
1 Drain scoop.
1 Lactometer.
1 Levelling board.
1 Single-barrel fowling piece.
1 Pair of pan scales.
1 Branding iron for marking sheep.
1 Theodolite.
1 Sickle.
1 Chester measure metallic tape, 66 feet.

Implements, Machines, Tools, &c., belonging to the Model Farm on the 1st *of April* 1874.

2 Iron ploughs.
4 Combined ploughs.
1 Set of iron harrows with swingletree.
2 Country carts.
1 Box cart.
6 Reaping hooks.
6 Hand-hoes.
8 Picottah buckets.
1 Chopper.
20 Feeding tubs.
1 Levelling board.
2 Spades.
3 Small wheel-barrows.
1 Clock.
6 Digging forks.
7 Yokes.
8 Planters' hoes.
1 Tub for well.
1 Scythe.
1 Weeding spud.
1 Tarpaulin.
1 Measure.
1 Half-mercal.
1 Scale triangle, weights, &c.
1 Large beam and cattle-weighing scale.
9 Fifty-six pound weights.
15 Plough shares.
1 Table.
2 Hand-hoes.
1 Knife.
1 Hay fork.
1 Mamoty.
1 Pair pincers.
1 Turn-screw.
1 Chisel.
1 Gimlet.
1 Bell.
1 Water cask.

List of Tools, &c., belonging to the Implement Workshops on the 1st *of April* 1874.

2 Large anvils.
1 Circular anvil.
1 Small anvil.
18 Tongs.
3 Bellows.
2 Screw plates.
4 Sledge hammers.
6 Small hammers.
6 Chisels, "Smith's."
8 Punches.
1 Countersinking punch.
4 Dies or flat chisels.
2 Pairs calipers.
1 Iron square.
2 Round files.
4 Half-round files.
3 Flat files.
21 Taps for screw plates.
1 Iron brace and five bits.
1 Filer's hammer.
1 Filer's cold chisel.
2 Hand vices.
7 Spanners.
1 Square file.
1 Angular file.
1 Bob drill and taps.
2 Screw liners.
1 Bench with 2 vices.
3 Hand saws.
1 Pit saw.
1 Cross cut saw.
7 Augers.
2 Jack planes.
1 Spoke shove.
1 Spirit level.
1 Shoeing rasp.
1 Pincer.
1 Compass.
6 Carpenter's chisels.
1 Cold chisel.
2 Set squares.
1 Angle square.
6 Gimlets.
1 Brace with 37 bits.
2 Adzes.
1 Hammer.
1 Turn-screw.
1 Plummet.
4 Saw files.
4 Rasps for wood.
1 Mallet.

List of Books added to the Apprentices' Library during the year 1873-74.

Transactions of the Agricultural and Horticultural Society of India, 8 Volumes, 1829, 1836, 1837, 1837, 1838, 1839, 1840, and 1841.
Leaves from the Book of Nature, by M. S. DiVere, 1856.
Instructions for the use and application of Pyrimont Seyssel Asphalte, 1860.
Rudimentary Treatise on Clay Lands and Loamy Soils, by Professor Donaldson, 1852.
Rudimentary Treatise on Mineralogy, by D'Varley, 1849.
Rudimentary Treatise on the Drainage of Districts and Lands, by G. D. Dempsey, C.E., 1849.
Bingley's Elements of Useful Knowledge, by Rev. William Bingley, A.M., 2 Vols., 1831.
Lardner's Cabinet Cyclopœdia on Heat, by Dr. Lardner, 1833.
Odling's Practical Chemistry, by William Odling, M.B., F.C.S., 1854.
Illustrated Geology, by F. C. Bakewell, 1856.
Botanist's Companion, by Professor Balfour, 1860.
Letheby on Food, 1872.
New Farmer's Almanac, by John C. Morton, 1866.
Do. do. do. 1868.
The Practical Sugar Planter, by Leonard Wray, Esq., 1848.
Elementary Chemistry.
Elements of Geometry, by Commissioners of National Education in Ireland, 1857.
Hints to Horsekeepers, by Henry William Herbert.
Allen's Rural Architecture, by Lewis F. Allen.
Boussingault's Rural Economy, by J. B. Boussingault.
Caldwell's Agricultural Chemical Analysis, by G. C. Caldwell.
The Forest Tree Culturist, by Andrew S. Fuller.
Milch Cows, by M. Francis Guenon.
Tobacco Culture, by 14 Experienced Cultivators.
Turner's Cotton Planters' Manual, by J. A. Turner.
The Carpenters' and Joiners' Handbook, by H. W. Holly, 1872.
The Mule, by Harvey Riley, 1869.
The Young Farmer's Manual, by S. Edward Todd, 2 Volumes, 1870.
Hop Culture, by 10 Experienced Cultivators.
Familiar Letters on Chemistry, by Justus von Leibig, 1859.
Elements of Agricultural Chemistry, by Thomas Anderson, M.D., 1860.
Principles of Agricultural Chemistry, by Justus von Leibig.
The Principles of Agriculture, by William Bland.
Scientific Farming, Made Easy, by Thomas C. Fletcher, 1861.
Chemistry in its relation to Physiology and Medicine, by George E. Day, M.A., &c.
Johnston's Experimental Agriculture, by James F. W. Johnston, M.A., &c., 1859.
The Sheep, by W. C. L. Martin, 1862.
The Pig, by W. C. L. Martin, 1860.
Pneumatics, by Charles Tomlinson, 1858.
Rudimentary Mechanics, by Charles Tomlinson, 1858.
Rudimentary Treatise on Well-digging, Boring, &c., by J. G. Swindell, 1852.
Rudimentary Treatise on Blasting and Quarrying of Stone, by Major-General Sir John Burgoyne, K.C.B., 1849.
Art of Constructing and Repairing Roads, by Henry Law, C.E., 1855.
How to observe "Geology," by H. T. DeBeche, F.R.S., 1836.
Horsekeepers' Guide, by James Mills, M.V.C.S.
Act No. I. of 1871, English.
Papers relating to Tea Cultivation in Assam, 1861.
Selections from the Records of the Madras Government, No. 23, Reports on the Fibres of Southern India, 1856.
Report upon the Present Condition and Future Prospects of Tea Cultivation in the North-West Provinces, 1860.
An Essay on the Culture and Manufacture of Indigo, by John Shortt, M.D., 1862.
Journal—Amusement for idle hours, and hints for the improvement of the resources of India.
The Earth, Plants, and Man, by Joachim Frederic Schoun, 1859.

Manual of Technical Analysis, by Bolley and Paul, 1857.
First Lessons in Geology, by Gidean Algernon, by Mantell, L.L.D., F.R.S., 2 Volumes.
Orr's Circle of Sciences, Elementary Chemistry, by John Scoffern, M.B., 1855.
Orr's Circle of Sciences, Geology, Mineralogy, and Crystallography, by Professor D. T. Austed and Professor Tennant, F.G.S., 1855.
Principles of Comparative Physiology, by Dr. Carpenter.
American Agriculturist, 1869—71.
The Illustrated Farmers and Gardeners' Almanac, 1873.
Orr's Circle of Sciences.
The Journal of Agriculture, January to June 1868.
Report on Caoutchouc, by James Collins, 1872.
Cotton—An account of its Culture in the Bombay Presidency, by Walter R. Cassels, 1862.
Collectors' Reports on the System of Agriculture followed by Ryots in the several districts of the Madras Presidency.
Madras Revenue Administration Report for 1870-71.
Do. do. for 1871-72.
Do. do. for 1872-73.
The Journal of the Royal Agricultural Society of England, Vol. VIII., Part II., 1872.
Do. do. do. Vol. IX., Part I., 1873.
Mantell's Medals of Creation, by Gideon Algernon Mantell, L.L.D., F.R.S., &c., Vol. I., 1853.
Do. do. do. Vol. II., 1853.
Report on the production of Tobacco in India, by J. E. O'Connor, 1873.